THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., NOVEMBER 14, 1889.

THE WEEK IN IRON CIRCLES.

General Features.

Barring the advance in all Southern irons reported on Tuesday of this week, the situation remains practically unchanged in the East, while some activity is being displayed in Western markets, as our reports below indicate. St. Louis reports that sales of Southern iron have been made at $2 per ton advance. Many furnaces withdrew entirely from the market, and others advanced prices $1 or more. At present consumers are waiting to see whether a regular boom is here or only another moderate advance. Louisville advices say that the furnaces offering any iron at all, are doing so at figures considerably above those current during last week, while many have withdrawn from the market, believing that by holding for a short time they will be able to dispose of their product at better prices than buyers will now pay. Cincinnati reports that Eastern speculators covered some 15,000 tons of Alabama iron and forced the price up from $1 to $2 per ton, with the result of bringing about an advance all along the line. These sales were for delivery during next year on warrants. No sales for legitimate consumption are reported at prices equal to these, but the market is a little higher and such orders as are booked, show a slight advance on last week. Sellers generally are more timid than buyers and it is hard to secure quotations on large lots of iron at or near current figures. The feeling is quite general that prices must advance further. Chicago buyers have been numerous in the market this week, and some of them for lots of considerable size. The expected lull after recent heavy buying has not proved to be much of a lull. Indeed, present indications point to greater activity. Foundries are all using more iron than they anticipated and need to cover for considerably more material than they planned early in the season. Lake Superior charcoal iron has taken another upward move and is now held firm at $21. Ohio softeners grow more and more scarce, and dealers mark up prices gradually. W. F. Jarvis & Co. report from Detroit: All grades of iron have been remarkably steady at regular rates during the week except Lake Superior charcoal, which has jumped up almost daily, owing to demands for car wheel purposes, and also owing to the fact that practically the entire surplus on hand the first day of October, some 40,000 tons, has been entirely absorbed. Almost all iron sold is for prompt delivery, and it is considered by all the furnace-men bad policy to sell at present prices for delivery during the first months of next year, as the charcoal iron trade, owing to the absorption of the surplus and the close of navigation, has never been in better condition for maintaining their prices than to-day. The Bessemer men are generally refusing to quote figures for 1890 delivery. The absence of old car wheels has been especially noticeable during the present month.

Iron Ore.

A question of the utmost importance to the Lake Superior iron ore interests presents itself in what now seems to be a well authenticated claim that the season of 1890 will see the manufacture of steel, by Eastern furnaces, almost entirely from American Bessemer ores. Letters are pouring in from Eastern steel mills, persistently inquiring for the price of Bessemer ores for next season, so as to enable them to fix a price upon steel rails. The Eastern manufacturers have never before cared for the price of Lake Superior ore, for which reason these inquiries at this time bear a deep significance. These manufacturers have learned that they will not be able to obtain foreign ores next year, and that they must, in consequence, depend upon their home product. The best possible confirmation of this view is found in the action of the leading New York firm of ore importers, which, when asked by Pittsburgh buyers for the price of next season's foreign ore, replied that it has engaged to send the ores it controls from the Mediterranean ports of shipment to England, where an advance has already been secured of two dollars a ton over the price of similar ores delivered in this country. The ore importations for 1889 fell far short of those of the previous year, and the 1890 imports will fall off at least fifty per cent. from this season's figures. If these statements are at all indicative of the future, 1890 promises to be the boom year of the Lake Superior region. Some premature announcements have been made of the sale of the Prince of Wales mine to the syndicate of Eastern bankers represented by Mr. Ferdinand Schlesinger, of Milwaukee. The fact is that Mr. Schlesinger holds options on the Buffalo, South Buffalo, Queen and Prince of Wales mines at figures aggregating, approximately, $700,000. The options run singly and some of them will not expire until the end of the month. The sale, however, if made at all, will be made in a lump. Another important sale about to go into effect is that of the Michigamme mine, for $385,000, to Messrs. J. H. Wade, Jr., Selah Chamberlain, E. R. Perkins, S. L. Mather, Samuel Mather and W. G. Mather, all of this city. The new company will organize on November 30, at which time the annual accounts of the Michigamme will be audited. The directors of the old company formally ratified the transfer yesterday. Still another sale is that of the Hemlock mine, just south of the Republic, to Messrs. Pickands, Mather & Co. of this city, the consideration being $40,000. Local furnace-men are getting nervous about next season's prices of ore and some of them have offered to cover their wants at market rates. Freights are very dull and shippers obtain all the concessions they want. The Escanaba rate during the week was one dollar.

Pig Iron.

The market is characterized by firmness in tone, as well as by dullness in trade; yet neither producers nor consumers appear to be worried, each doing a thriving business. It must not be forgotten that the purchases made in the early part of October mount up to an enormous quantity of iron, the delivery of which is keeping every available furnace driving day and night, and is likely to keep them so employed until the close of the year. The general run of consumers will, in this way, be supplied during the next six weeks, while the furnaces have engaged all their product for '89, and are in no position to take new orders for this year's delivery. This combination of circumstances, backed up and strengthened by the furnace-men's disinclination either to quote or sell iron for '89 delivery, is very likely to result, along the middle of December, in a very active buying movement, contrary to the experience of the past, which has hitherto denoted the Winter months as an "off" season. Ruling quotations for Bessemer are $20.50, cash, at the furnace, with all lake ore No. 1 foundry at $18, under similar terms. There is more inquiry for forge iron and American-Scotch brands, than for foundry pig.

Merchant Iron.

Trade is good, and while no material advance is noted as to price, the mill men seem less inclined to grant any concessions. Bar iron is quoted at from $1.75 to $1.80, according to the size of orders. Sheets of the thinner gauges are extremely scarce, $3.50 being paid at the mill for No. 27.

Hardware.

Metals are advancing rapidly, copper and tin leading the list. Manufactured hardware is just beginning to feel the advance in the raw material, and prices are being correspondingly advanced. Gas pipe, particularly in large sizes, is scarce and high.

PIG IRON SPECULATION AT HOME AND ABROAD.

The *Age of Steel*, which, we regret to see, has of late developed a penchant for Free Trade and pig iron speculation, prints the following in a recent issue:

We beg leave to call the particular attention of our esteemed contemporary, *The Iron Trade Review*, to the following extract from an editorial in the *Iron and Steel Trades Journal*, of London: "Last year we spoke of the heavy stock in Connal's stores in Glasgow, as the 'wet blanket' of the trade, but a wet blanket is useful at times, and we fancy that the million tons of Scotch pig iron stored in Glasgow has played, and is playing, a useful part in the improvement which began last year. While we are gratified to know that the iron smelters of the kingdom are now selling their pig iron at remunerative prices, and recouping themselves for losses incurred during the 'lean years' through which the trade has recently passed, still we wish to see the quotations for pig iron kept within moderate bounds. * * * The condition of the pig iron trade in Scotland, on the West Coast, in Cleveland, and, indeed, in all districts, is decidedly healthy, and the legitimate demand from the mills, forges and foundries, supplemented by shipping requirements, is sufficient to maintain present rates, and gradually advance them to a still higher level without the efforts of the speculators, whose ardor, for the present, is kept in check by the 'wet blanket' of which Messrs. Connal & Co., of Glasgow, are the custodians. Next week the October quarterly meeting of the iron trade will be held at Birmingham, on Thursday."

The paragraph has had our due consideration, and we now invite the attention of the *Age of Steel* to the following extracts from still later issues of influential London trade papers. First of all we have this significant comment of the *Ironmonger*, showing how the pig iron warrant scheme is regarded in London:

The promoters of the American Pig Iron Warrant Storage Company do not seem "to get much forrader," judging from the latest news relating to their enterprise. They have recently issued a circular showing that only four grades and fifteen brands have been recorded for sale, although they promise to make additions and alterations as circumstances may require. According to the New York papers no data is forthcoming to show the quantity of iron covered by warrants, but it is assumed that the tonnage is not great; indeed, the *Iron Age* says it has reason to believe that the quantity does not reach 10,000 tons. If that estimate is anything like correct, then it would almost seem that the American Warrant Company's mission is a virtual failure.

This we find in *Ironmongery*, of London, and it isn't on the side of the pig iron speculators, either:

A pig iron warrant exchange is an established fact in the United States, and the American Pig Iron Storage Warrant Company has commenced business with contracts for storage, it is said, for something like 30,000 tons of iron up to February, 1890. It will be interesting to watch the progress of this movement, which has had many vehement enemies among the iron producers of the States. They have not failed to point to the disastrous effects of heavy accumulations, like those at Glasgow, in depressing the legitimate market in the early days of a revival following a depression. Nor have they neglected the lesson which we could teach them of the injury inflicted by the introduction of a purely speculative element into the industry. All this has, however, been in vain, and the project is an accomplished fact for good or ill, as may be. If it should attain to such proportions as would secure it the attention of clever "operators," we shall expect to witness some day scenes of frantic excitement, such as have on several occasions taken place in the Chicago Wheat and Corn Exchange, though it will not be so easy a matter to "corner" a product which is perennial. There will be abundant opportunities for speculation, however, and the resulting evils upon the community at large. If the best and leading iron makers stand sternly aloof from it, the warrant scheme will never be capable of inflicting any great harm upon the industry.

It pains us now to have to quote from the *Age of Steel's* own authority, but in the *Iron and Steel Trades Journal*, of October 26, 1889, we find the following leading editorial which puts an entirely new complexion on the matter. If our St. Louis contemporary, or its allies of the New York Metal Exchange can derive any comfort from it, we would be pleased to learn just wherein such comfort consists. Says the London paper in question:

"'We make no bones of the fact that the chief object of the Metal Exchange is to systematize, and so far as possible, foster speculation,' so writes Mr. E. L. Shriver, secretary of the New York Metal Exchange, to an American contemporary (*The Iron Trade Review*). Mr. Shriver, in parenthesis, remarks that this is the object of all Exchanges. Mr. Shriver should be the best authority as to the chief object of the New York Exchange; but we are not inclined to accept his dictum that all Exchanges are established with the same end in view—viz.: the fostering of speculation. It is, however, almost impossible to instance any business transacted which does not possess some element of a speculative nature. It is also true that an entire absence of speculation, means dullness in trade, while, when a speculative spirit is abroad, business on all sides speedily becomes prosperous. We are disposed to approve of the frankness with which Mr. Shriver hangs out the shingle of his Exchange with the word 'Speculation' for its motto. But the term is capable of various interpretations, and it is possible that the business which Mr. Shriver is an advocate of, is not what we should term healthy speculation, but the reverse. The forge owner who makes forward contracts for pig iron for his puddling furnaces, and so provides raw material from which to manufacture iron he has not yet sold, is a speculator, presumably for a rise, while if he contracts to deliver finished iron without having first purchased the crude material, he is a speculator, apparently for a fall—in pig iron. Without crossing the Atlantic to study the working of the New York Metal Exchange, we have the London Metal Exchange, and the Glagow pig iron market from which to draw examples. The committee of both these markets would agree with Mr. Shriver that their rules are formed with the view of systematizing speculation, and though they might not be so candid as Mr. Shriver, and admit that they are intended, 'so far as possible to foster speculation,' yet by systematizing and facilitating operations, they, in fact, 'so far as possible' foster speculation. A few years ago the London Metal Exchange carried out a stupendous speculation in tin, which forced the price of the metal from £70 to £170 a ton, a transaction which involved and ruined hundreds, made fortunes for a few, and on the whole, had an injurious effect on trade. Since then, copper has been the medium for a great deal, but the metal was too heavy to handle, and the grand *coup* did not come off. If this sort of business is the 'speculation' which Mr. Shriver's Exchange exists to foster, then we regard the New York Metal Exchange as more calculated to injure than to foster the metallurgical industries of America. The Glasgow iron brokers cannot be accused of having cornered the pig iron market or created a scarcity of pig iron. The result of the speculation which Mr. Shriver says they 'systematize, and so far as possible foster'—has been to accumulate a million tons of pig iron in the public stores, which stocks have been variously regarded as 'a white elephant' and 'a wet blanket.' Certainly, their proportions are elephantine, and their existence has had a damp, depressing effect on the market for pig iron generally. Speculation within limits defined, yet difficult to delineate, is beneficial to trade. We think that 'fostering speculation' is outside the province of Exchange committees, and such efforts tend to carry speculation beyond limits to which, if not confined, it will hamper instead of stimulating legitimate trade.' 'Seats' on the New York Metal Exchange, as in almost all other exchanges in America, are sold to the highest bidder. The larger the amount of speculation going on on the floor, the greater are the opportunities of making money, and, consequently, the more valuable the seats. Our readers will therefore understand that the committee of the New York Metal Exchange have special reasons for doing their utmost to foster speculation, as they thereby increase the value of their property in the Exchange."

We think the subject may be dropped at the present juncture to allow our St. Louis and New York friends to think the matter over a little further.

A NEW MINNESOTA IRON DISTRICT.

The western end of the iron range north of Duluth is attracting no little interest and attention just at present, on account of the newly discovered iron mines in that section, extending some 150 miles to Gunflint lake, on the Canadian boundary. The formation is entirely different from that of the Vermilion range north of it, and there will be none of the open pit mining that has been carried out on the Vermilion at Soudan and Ely.

Already there has been a thorough examination of the country by explorers and iron men, but no development has been made except east of Prairie river. Here working shafts have been sunk and two diamond drill test holes run, in one of which a body of clean ore ten feet thick and in the other seventeen feet thick was found. At one of the shafts a body of ore was found at the surface, but this, it is believed, is float and not to be depended on. All this ore is of a remarkably good quality and rich as any one can want. Active prospecting is now going on, and in a few months, probably by January, a very good idea of the extent and richness of the ore yield can be had.

It is thought that the ore will be found in large bodies, but in underground workings almost entirely. Being in layers, or apparently stratified, the mining will be different from that followed in iron ore operations on other parts of the Lake Superior region, and will be more after the fashion of coal mining. That the ore is exceedingly rich there seems to be no question, and that not only one mine, but many, will contribute their quota of Bessemer ore to the output of the Vermilion range appears to be assured.

NOTHING is gained in concealing the fact that year by year Cleveland's harbor facilities, instead of improving, are deteriorating. With a well-protected harbor of refuge, and with a second breakwater building, vessel-men prefer Ashtabula and even Fairport to Cleveland. The difficulty is one mainly of dredging. The river is sanding up much faster than the feeble effort made by the city by way of dredging seems able to prevent, and every large boat that has come up the river this season has found bottom. The city authorities do not seem to understand that they are driving away millions of dollars from their very doors. It is difficult to understand why the insignificant item of expense for dredging is not willingly borne by a city that pays out by way of interest on its debt more every year than it takes to provide for all other expenses. The vessel interests, the ore interests, the iron interests, are among the most heavily taxed, yet the city does nothing for them in return. Indeed, the suggestion has been made that the vessel-men should have the channel dredged at their own expense. There is as much justice in the claim as there would be in asking a business man to have the

thoroughfare in front of his establishment cleaned at his personal expense. The result of the city's inaction is made plain by the falling off in vessel freights here, and the increase elsewhere, and if Cleveland loses her lake trade she has nobody to blame but herself.

A CURIOUS phenomenon is found in the sudden inflation of iron values in England. But a few years since, England was flooded with German iron, more particularly with merchant iron, such as channels, beams and other structural shapes. Prices at that time were low. The situation has now become changed to one of unprecedented activity among English iron makers, accompanied not only by correspondingly high prices, but also by very large exports into Germany. The problem, embracing as it does an economic question, is well worth consideration; the more so since all English authorities upon the subject combine in denying any speculative movement on their part. It may be remarked in this connection that English pig iron has been advanced some 50 per cent. in price, and that notwithstanding this advance, the cost of production has been so largely increased as to give the furnace-men, as yet, no material benefit.

FACTORS OF SAFETY.

BY JOSEPH R. OLDHAM, N. A.

In continuation of my recent paper on "Riveted Seams," I will now endeavor to show how dangerously misleading and discouraging to good designing a nominal factor of safety may be, when the percentage of strength of the riveted joint is not taken into account as a factor in calculating the proper working pressure for a cylindrical boiler. It may surprise some people to learn that though we start off by taking one-sixth of the lowest tensile strength found stamped on any plate, by the thickness of the thinnest plate, the factor of safety for a double riveted boiler, made *in acordance* with the rules issued by our supervising inspector general, may not be greater than two and three-quarters, but may be much less.

These rules say, "and the sum will be the pressure allowable per square inch for single riveting, to which add twenty per centum for double riveting."

As we are now mainly considering high pressure cylindrical marine boilers, we may at once discard single riveting, and only as a step up, consider double riveting for the moment. It is possible to obtain forty-five per cent. of strength of the solid plate by a practicable single riveted lap joint, but this is far above the average strength of such joint; however, let us assume this to be the per centage as a basis to work from "to which add twenty per centum for double riveting."

I may observe in passing that the late Sir William Fairbairn found the difference between single and double riveting to be only fourteen per cent., but let us take fifty-five as the strength of a double riveted lap joint in comparison with the solid plate, now a cylindrical boiler, say fourteen and a half feet mean diameter—with such longitudinal joints—one and three-eighths inches thick, would be allowed a working pressure by these rules of 162 pounds per square inch, and the factor of safety would then be less than two and three-quarters. The British Board of Trade rules require a factor of at least five, and the British Admiralty rules, though not formed for a factor as such, amounts to three and a half.

The thickness of shell, assuming the same strength of material in every case, as per Board of Trade rules, would be inch and five-eighths full. American rules require one and three-eights inch, nearly; Lloyds Register rules, one and five-sixteenths inch, and the Admiralty, one and five thirty-seconds inch; thus, with plates sixteen per cent. heavier than the last quoted rules, our factor of safety is barely two and three quarters against their three and a half. It is quite true we have some superior boilers made in this State, in which the factor reaches three and a half, but these are the exception, being altogether above and beyond these rules, and the makers receive no credit whatever for extra riveting, etc.

Suppose we dispense with a factor of safety altogether as such, and take the strength of the plates when reduced by the actual percentage of the riveted joint. A plate fifteen-sixteenths thick by eighty-three per cent. would be stronger than a plate one and three-eights inch by fifty-five per cent. at joints—though fifty-five is above the average of double riveted boilers, and in ship work, for the most part, the strength of the joints do not exceed fifty-two per cent. of the solid plate.

Less than an inch is much too thin for a boiler shell fourteen and a half feet diameter to work at 160 pounds pressure, but the factor of safety, even with this thin plate and a proper joint, is actually greater than our rules require with a plate nearly fifty per cent thicker.

In boilers of very large diameter, made up of narrow plates, I venture to submit that the thickness of shell could be reduced with safety and advantage, if the strength of the shell, as a whole, were based on the percentage of strength at the weakest riveted joint. The Admiralty rule has no factor, but assumes four-ninths of the actual strength at the riveted joints, as the proof strength, and they test their boilers to this, and deduct ninety pounds to obtain the load for the safety valves. The boiler I have quoted would possess a factor of three and a half by this rule.

The steel boilers of the S. S. "Egypt," built in 1872, split circumferentially round the shell, but this occurred in the solid part of the plate and was due to the irresistible stress set up by expansion and contraction, which was probably somewhat abnormal through too frequent and irregular use of the donkey cold feed, or, it may have been that the cracks were in the steel plates before the boilers were put on board; in any case, it was not due to thinness of plates, for after straps had been fitted over these cracks and the rivet holes made slightly oval, the boilers gave no more trouble, though they remained working for over ten years.

To attempt to regulate the pressure of a boiler on the strength of the words "single and double riveting," without taking into account the amount of metal punched or drilled out of the plate, or the area and strength of the rivets put in, may be dangerously misleading, for the difference between even a "*double* riveted joint" and the most approved triple means that two steel boilers may be of the same diameter and be licensed to carry the same pressure of steam, though the one be anywhere about thirty or forty per cent. stronger than the other.

THE MINERAL RESOURCES OF PERSIA.

The appointment of General Houtum Schindler, a foreign officer, who has served the Shah with distinction for twenty years, to be chief Inspector of Mines in Persia, under the concession to the Imperial Bank of Persia, will cause some inquiry as to what we know of the mineral resources of that country. When the late Sir Charles Macgregor compiled, eighteen years ago, his "Gazetteer of Central Asia," he summed up the mineral wealth of Persia as follows: "Naphtha is found at a spring at the foot of the Bakhtiari mountains, between Shustar and Ram Hormaz, also near the village of Dalaki, in Fars; sulphur and saltpetre as being in the mountains north of Teheran, and the latter also in the Khalhal district of Azarbijan." He also refers to the still more important mines of copper, silver and iron in Azarbijan, Mazanderan, and Kirman; coal of excellent quality, and in any quantity, near Shahrud and the villages of Hir, northwest of Teheran. More recent surveys have shown that the supply of coal in Persia is not restricted to one or two places, that the quantity is practically unlimited, and that at the pit's mouth it can be produced and sold for five or six shillings a ton. At present coal is only worked at Hir, forty or fifty miles from the capital, where the output each year is 15,000 tons. In the Elburz mountains as many as twenty-five separate mines are known to exist, but they have only been worked by the villagers in a rude and primitive manner. In southwest Persia, from Ispahan to the hills north of Bushire and westwards as far as the Karun, numerous coal fields have also been discovered, and samples of the coal have been tested. From this source it will be possible to stimulate and to cheapen the cost of navigation in the Persian Gulf. Iron is believed to be found in close conjunction with these Persian coal fields, but at present only one mine near Teheran, producing excellent ore and 70 per cent. of metal, is likely to be seriously worked. The Elburz range is also rich in this mineral—the ore producing from 25 to 60 per cent. of metal. Copper is found throughout the country, and was one of the chief exports from Gombroom 170 years ago. There is also abundance of lead in the Elburz mountains, and, as there is a great demand for this metal in Russia, it is expected that a profitable trade in it can be carried on across the Caspian. Among the other mineral resources of Persia may mentioned borax, manganese, asbestos and mercury. Naphtha and petroleum have also been referred to, and as they are to be found in greatest abuudance near the Karun, they can speedily be turned to practical purposes.

ACCIDENTALLY OMITTED.

The accompaniyng diagrams should have appeared in connection with Professor Elsom's article last week on "Friction Relieved by Lubrication," but

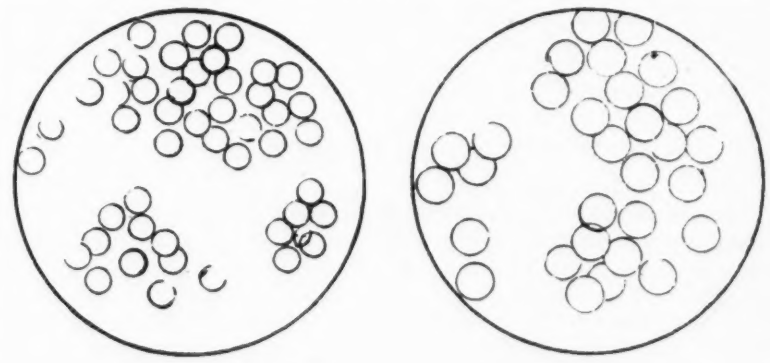


FIG. 1.—50° FAHR. 200° FAHR.

were accidentally omitted. Such of our readers as are interested will no doubt be able to connect the two, though a week apart.

Artistic Hardware.

When America begins to "yearn" for artistic hardware it is quite time to begin to look for a permanent "set" in public taste towards a combination, in the work of the ironmonger and the smith, of pure utility with beauty in form or ornament; and there are signs that this yearning has commenced over the water. It is accompanied with some frank acknowledgments that portions of Europe, especially France and Germany, are much in advance of the rest of the world in the artistic excellence of their builders' ironmongery and the employment of metal work for interior decoration; a superiority which is, however, now found to be worthy of emulation, as public taste is improving and demanding something better than the manufacturer and metal worker have hitherto supplied. This discovery is, as we have said, a sign of the times; it is the product of certain influences which were set going in our own midst several years ago, and are gradually widening out and propagating a new want. It is a tendency which the manufacturer and the dealer should take note of, and which, once set in motion, they will find it to their profit to encourage.—[Ironmongery (London).

THE OUTLOOK FOR MANGANESE.

The *American Manufacturer*, of Pittsburgh, discusses the rapid advance in prices of manganese and the shortness of the supply, and says: "One of the most remarkable 'jumps' in prices, in the history of the iron trade is the recent rapid advance in the price of 80 per cent. ferro-manganese, and to a less extent the advance in spiegel. In the two weeks, from September 19 to October 3, ferro jumped from $66 to $90, and for immediate delivery the price still remains $90. The advance in spiegel (20 per cent.) in the same time was from $32 to $40. The advance in spiegel was, therefore, 25 per cent., and in ferro 36 per cent. The lowest prices, both of spiegel and ferro, were at the beginning of the year. The advance in the price of spiegel has been from $28 to $40, and in ferro from $54.50 to $90.

"What are the prospects as to the future supply of manganese ores? There is no question that the outlook is not a good one. The production of manganese ores in 1888 was considerably less than in 1887. In 1887 the production of high-grade manganese ores in the United States was 34,524 tons. In 1888 it had fallen to 25,500 tons. There was a reduced production in all three of the producing districts of this country, viz.: Crimora, Va.; Cartersville, Ga., and Batesville, Ark. The production of other countries, measured by the imports into Europe, which gives the best, indeed the only available, idea of production, also fell off in 1888, as compared with 1887.

"The imports of manganese ores into Europe in 1887 and 1888, were as follows. The details of the imports for 1887 have not been secured, only the totals:

IMPORTS OF MANGANESE ORES IN EUROPE IN 1887 AND 1888.

Into	1887—Tons.	1888—Tons.
Great Britain	.....	74,906
France	.....	6,174
Belgium	.....	1,945
Germany	.....	9,624
Total	120,615	92,649

The sources of the 92,649 tons imported in 1888 were as follows:

	Tons.		Tons.
Caucasus (Russia)	48,653	Sweden	6,089
Chili	24,746	Australia	1,572
Spain	2,830	New Zealand	787
Portugal	5,638	Canada	248
Turkey	669	Sundries	532
Italy	385		
Greece	500	Total	92,649

"All of the ore from the Caucasus contained 53 per cent. to 55 per cent. metallic manganese, but from .15 per cent. to .16 per cent. phosphorus. That from Chili contained 50 per cent. to 54 per cent. and free from phosphorus. The Swedish mineral is somewhat silicious."

"Where supplies in addition to these," says the *Manufacturer*, "are to be obtained it is difficult to say. The world has been searched for manganese deposits for years. It is true that there are many known deposits that may prove of value in the future that have not been worked because of present inaccessibility or high cost of transportation. It is believed that there are a number of such deposits in Virginia, some in Arkansas and in other States. The present prices of manganese ores, which are for a 50 per cent. ore with not more than 8 per cent. of silica and 10 per cent. of phosphorus, 31 cents a unit for the manganese and 10 cents a unit for the iron delivered at Pittsburgh, may stimulate developments and search. It is also possible that at some of the manganese mines in the mountains of Virginia, where there is plenty of charcoal, small furnaces may be erected and ferro made and 'teamed' to the railroads, the haul being a ton of ferro worth $90 at market instead of a ton of ore worth $15. We also hear of a discovery of manganese in Asia Minor, near Trebizondi, that will yield 10,000 tons this year, but the outlook for a largely increased supply of manganese ore—large enough to materially reduce prices—is not very good, especially while the present demand for Bessemer and open-hearth steel continues."

DETERIORATION OF STEEL SHIPS.

What constitutes a proper coating for a vessel's under-water lines? This is a question that has been revolving in the scientific minds of naval constructors and engineers for a long time, and one that must be settled, now that the new steel Navy is well under way. In fact, officials at the Navy Department have had under consideration for a long time several "preventives" against the fouling of ships' bottoms, and the sentiment seems about to settle upon sheathing as the remedy. There have been no end of mixtures proposed and tried as anti-foulers. For some time a mixture of red lead and white zinc has been used, but it is not effective. Zinc has been proposed and tried on vessel's bottoms, but has not proved sufficient.

The Japanese have discovered a mixture, a kind of lacquer such as is used on most of their work, which is claimed to be an excellent coating for the submerged portions of ships' hulls to protect them against marine growth and pitting by voltaic action. But it is so expensive as to be practically out of the question to adapt it to use upon vessels of the Navy.

The frequent docking of the new steel cruisers has shown how rapidly the marine growth accumulates upon them, especially at the Navy Yards and in the Pacific, and the effect that has been produced upon the hulls through chemical action. The Ranger, one of the oldest of the iron vessels in the Navy, now on duty in the Pacific, was recently put into drydock, and about twelve tons of barnacles and other growth was removed from her. Before this was done her speed had been reduced from eight knots an hour on seven tons of coal a day to less than six knots on from twelve to fourteen tons per day. The Alert, a sister ship to the Ranger, had had the same experience, and her commander reported: "The bottom was very foul, it being estimated that more than twelve tons of barnacles were taken off. To dock this ship it cost, for the four days we were in dock, $2,782 in money. Running from Payta to Callao, before docking, we use 80 tons of coal obtained here at $20 per ton, amounting to $1,600. If the bottom had been clean we would have used only 25 or 30 tons for the trip, making a saving of $1,000."

The Atlanta originally received a coat of anti-corrosive paint next to her plating, and an outside coat of anti barnacle-clinging paint. On an examination of her hull about three months ago, it was found that the barnacles had eaten their way through the anti-corrosive paint and firmly attached themselves to the ship's bottom. The effect of this growth upon the speed of vessels has been frequently demonstrated. For instance, upon the six-hours' trial on April 13, 1887, the Atlanta attained a speed of 15 1-2 knots, but upon her recent trial at Newport her speed was a little over 13 knots only. This difference was accounted for by the fact that she had been lying in the foul waters of Wallabout Bay for several weeks before the trial, and a large marine growth had become attached to the bottom. The Dolphin, on her recent cruise around the world, became so foul on the bottom that her speed was materially lessened, and when she went into dry-dock in England several tons of stuff were taken from her bottom.

A more serious evil to steel ships than fouling, and one not so easily remedied, is the pitting of the hull from galvanic action due to various causes. This deterioration has been particularly exhibited in all of the new ships. Frequent docking of steel vessels, both of the Navy and of the merchant marine, has been shown to be necessary; and frequent docking means great expense, especially to those of the Navy when private docks are used. A serious question in connection with the docking of naval vessels is suggested by Naval Constructor Hichborn—that of international law. If coal and other supplies are declared contraband of war, will not the docking of war vessels be placed in the same category? And an unfriendly nation would no doubt say: "No coal or docking facillities permitted to belligerents." What is to be the remedy? This was the question discussed before the Naval Institute recently by Constructor Hichborn, and he demonstrated the necessity of sheathing. It is not a new idea. Sheathing was in use so early as the first century of our era, and then the art was lost and subsequently rediscovered. The question also came up during the construction of the Roach cruisers, but was decided adversely by the Advisory Board. Their objection was that the weight of the sheathing increased the displacement, or, that it would require more power to drive a given displacement through the water.

The sheathing of a vessel is the fastening of sheets of alloy of copper on the submerged portion of the hull. Passed Assistant Engineer John A. Tobin, one of the officers of the Dolphin, has invented a bronze metal which has been experimented with, and which Constructor Hichborn recommends for all of the vessels of the Navy. A large quantity of this metal is now being manufactured by the Ansonia Brass & Copper Co., to be used in the construction of machinery for the new cruisers. Mr. Hichborn admits that it will add to the displacement of a vessel, but no more so than the weight of barnacles, and that a seventeen-knot sheathed vessel that will not foul her bottom, and will make full speed when called upon, is better than a twenty-knot one that cannot get away from a dry-dock.—[New York Tribune.

What is the Life of Corrugated Iron?

At a recent meeting of the Connecticut Association of Engineers, a paper by Mr. C. M. Jarvis was presented on "Iron Roofs." In the discussion which followed, Mr. Field was asked the question, "What is the ordinary life of corrugated iron?" He replied: "The life of a corrugated-iron roof depends on what gauge of iron you use or whether you use it galvanized. You can put it on to last 100 years, but ordinarily it will not. Iron near the seashore will go faster than inland. There are instances where that iron has lasted 20 to 25 years; other times it has gone in 5 or 6. There is no repair except to put a new sheet on. You can take off any one sheet and renew it. We have had roofs on our place 17 years, and they do not leak very badly now. We keep them painted. A good many places where they have lost corrugated-iron roofs they have not painted them. We use metallic paint. Those that last the longest are galvanized iron. Many people put on 26 iron, which is not much better than paper. If they will put on 18 or 20 galvanized, they will have a roof to last practically, forever. They put on 26 frequently. There are three or four gauges—standard, Birmingham and others—and you must be posted on what gauge you are buying, for 26 in one might be 28 in another man's. You gauge it by the weight per foot."

Zeicon—What is It?

Zercon is a metal not found pure. In fact, no use for the pure metal has ever been found, therefore, it has not been reduced. An oxide of this metal, called zerconia, is the most infusible of all the known oxides. The oxide is reduced to a fine powder. A common cotton wick is thoroughly filled with the powdered oxide, then the cotton is burned out. The wick is all consumed excepting a thin, delicate, snow-white column of the zerconia, which is left exactly the shape of the wick.

As the burning gas impinges upon this column of oxide, the latter becomes heated white hot, and glows with a soft incandescence, second only to the electric light.

A mechanic may not know the name of this burner from the above description, but it is named the Welsbach, and by that name will be readily recognized.—[Northwestern Mechanic.

The Threatened Exhaustion of Iron Ore at Bilbao.

The British Consul, at Bilbao, states that some of the best mines in the immediate vicinity of that port are becoming exhausted; but Biscay is an "iron country," new districts for the extraction of its metallic soil being selected every day, and in a few years the province will be intersected by a network of railways in communication with the port of Bilbao. Consequently there is no reason to fear any sensible diminution of the export of iron ore at present.

AMONG THE IRON MINES.

Lake Superior Shipments of Iron Ore:—

Shipments of iron ore from the mines of Lake Superior, for the season of 1889, up to Wednesday, November 6th, are as shown by the appended statement, condensed from the Marquette *Mining Journal:*

MARQUETTE RANGE.

American	15,614	Grand Rapids	5,007	Queen	53,512
Angeline	19,178	Hartford	566	Republic	253,750
Barnum	6,435	Humboldt	15,866	Republic Reduction Co.	21,280
Braastad	95,127	Jackson	63,211	Riverside	3,712
Buffalo	36,226	Lake Superior	50,467	Salisbury	53,694
Buffalo, South	7,966	Lillie	30,412	Samson	449
Cambria	61,673	Lucy	23,199	South Buffalo	56,013
Champion	194,879	Marquette	59,927	Superior	219,150
Cleveland	251,532	Marquette Ore Co.	5,169	Volunteer	52,111
Cliffs shaft	116,597	Michigamme	42,840	Webster	448
Curry	16,671	Milwaukee	50,513	West Republic	1,509
Detroit	6,065	Negaunee	73,258	Wetmore	18,612
Dexter	3,895	North Champion	7,757	Winthrop	20,849
East Champion	2,697	Pitts. & L. Angeline	191,780	York	12,844
East New York	21,414	Prout	7,423		
Edison	893	Quartz	491		
Total, Marquette Range					2,295,534

MENOMINEE RANGE.

Aragon	613	Half & Half	4,895	Norway	65,251
Armania	44,670	Hamilton	8,347	Paint River	28,049
Chapin	453,828	Iron River	155,574	Perkins	10,826
Commonwealth	96,831	Ludington	94,246	Shafer	9,237
Cyclops	33,360	Mastodon	57,812	Sheridan	504
Dunn	134,629	Mastodon, South	2,094	Sturgeon River	4,775
Florence	161,115	Millie	12,008	Vulcan	145,766
Great Western	35,813	Monitor	11,843	Walpole	9,616
Total, Menominee Range					1,582,328

GOGEBIC RANGE.

Anvil	36,114	Iron King	39,413	Pence	75,722
Ashland	217,646	Ironton	8,636	Ruby	8,880
Aurora	179,265	Montreal	10,097	Section 33 south	45,223
Brotherton	53,226	Norrie	537,147	Sellwood Colby	25,603
Cary	43,753	North Montreal	26,499	South Colby	50,035
Colby, Beaver	44,676	North Section 33	24,295	South 15 Colby	10,280
Germania	98,248	Odanah	4,446	Windsor	14,576
Globe	9,814	Pabst	91,846		
Iron Belt	48,037	Palms	10,446		
Total, Gogebic Range					1,713,893

VERMILION RANGE.*

Chandler Mine	281,390	Minnesota Iron Co.	474,346	Pioneer	3,144
Total, Vermilion Range					758,880
Grand Total					6,414,635

*Shipments for past week not included.

The total of lake shipments is so close to 6,500,000 tons, that it is certain that further shipments will take it above that figure before the shut-down of navigation, and the rail shipments for the year added in, will bring the total output of the mines for 1889 very near, if it does not reach, 7,000,000.

Lake Superior Mining Notes:—

MENOMINEE RANGE.

The Mastodon mine will ship close to 75,000 tons of ore this year. "Dead work" will be carried on quite extensively in addition to making a stockpile. It is the intention of the lessee, Capt. C. T. Roberts, to ship not a pound less than 100,000 tons next year. The mine, under his careful management, is capable of accomplishing such a season's output without any straining. The main hoisting shaft at the west end (now over two hundred feet deep) will be put down another hundred feet the coming Winter, which will give additional ground to work.—[Florence Mining News.

VERMILION RANGE.

Work will commence next Monday sinking shaft No. 2, at the Chandler. The shaft is now down 175 feet, and the intention is to put it down 100 feet further, or two levels.

It is expected that by next Saturday night the Chandler mine will have shipped 300,000 tons of ore. About 294,000 tons had been sent forward last Saturday night, and this, with the present week's shipments, will practically wind up the output for the season, although some small orders may yet be sent forward before the close of navigation.—[Vermilion Iron Journal.

MARQUETTE RANGE.

The Hemlock mine, down the river from Republic, and of which Republic parties were the owners, was sold to Cleveland parties on Tuesday for $40,000 cash. It is a good property, but from its isolated condition, and the large amount of money required for its proper equipment, the sellers concluded that it should be in stronger financial hands.—[Negaunee Herald.

Mining, shipping and all the usual operations of the South Buffalo Mining Co. have been fully resumed, and the work is going forward with more than ordinary activity. The result of the late cave-in proves to have been more beneficial than otherwise and, withal, serves as a timely warning for the future security of the workings.

In the new discovery made by the Pittsburgh & Lake Angeline Iron Co., some distance to the east of their main workings, a half mile at least, and close to the east end of Lake Angeline, the company posseses an ore deposit of remarkable quality. It yields from 67 to 68 per cent. in metallic iron and is sold to average no higher than .007 per cent. in phosphorus.—[Iron Ore. The Cleveland Iron Mining Co. is exploring the lands immediately upon the east of the Lake Angeline find and is reported to have struck the same vein of ore.

GOGEBIC RANGE.

The final clearing up of the stockpiles at the Colby was completed last Wednesday, and it is not likely that much more ore will be sent to the docks from the mine this season. It does not follow, however, that mining will cease or even that the present force of about 200 men will be materially, if at all, reduced. It is expected that an average of from 15,000 to 18,000 tons per month will be raised during the Winter, which, with no increase through the more active season, would aggregate a round 200,000 tons for the year. But we are safe in saying, with all human certainty, that the mine will be more actively wrought next season.—[Pick and Axe.

Thursday the Norrie rounded the 600,000-ton point and took a good start for 100,000 more before the year closes. This is by far the greatest record ever made by any mine, and places the Norrie at the head of all competitors. That one mine could mine and ship such a quantity of ore in a year is one of the wonders of the age. Such a feat would not have been dreamed of a few years ago, and it remains for the great Gogebic producer to demonstrate what can be done in the line of iron ore production. When the new plant, soon to be completed at the Norrie, is in use, it will then be able to push a 1,000,000-ton output pretty close.—[Ironwood Times.

Notwithstanding the recent assay made by Mr. Dickman, chemist of the Otis Iron Co., of Cleveland, which showed Caledonia ore to be a very superior grade of Bessemer, Mr. Byron N. White, who is about to invest in mining property, visited the range this week and determined to ascertain for himself the precise character of the product. He selected a number of samples and had them analyzed by a chemist of his own choosing. The result was even a trifle better than that of the first analysis—65 per cent. in metallic iron and only .028 in phosphorus—one per cent. higher in iron and $\frac{3}{1000}$ lower in phosphorus. This conclusively settles the question as to the character of the Caledonia ore, and also establishes the fact that the Caledonia formation is entirely different, separate and distinct from any other yet developed in that region.—[Florence Mining News.

CENTRAL HEATING STATION AND POWER SUPPLY.

A paper on this important subject was contributed by Mr. W. W. Phipson, to the Mechanical Section, at the recent meeting of the British Association, at Newcastle-on-Tyne. The author commenced his paper by commenting upon the growing necessity of a central heating and power supply for cities and large towns, and of the dangers and inconveniences of the present system. He took for his model the scheme in successful operation, since 1887, in Boston, Mass., which is known as the Prall system, and explemplified by the Boston Heating Co. This system consists in the constant circulation of water at a high temperature and pressure (viz.: at 400 deg Fahr., and 250 lbs. on the square inch) from the batteries of boilers at the central station, through the supply mains and back to the boilers by means of the return mains, the circulation being maintained by means of pumps. The ample scope of the system was next entered upon showing that it was quite adequate to meet all requirements, as regards both heat and power. The method of determining the amount of heat or power supplied to the consumer was described. With regard to the loss of heat by radiation, it has been reduced to a minimum by covering the mains with a non-conducting material, reducing the internal temperature of 400 deg. of the pipe, to 110 deg. on the outside of the covering.

The construction of the pipe trenches, or conduits, was described, together with the sizes of mains, etc. The details of the construction of the mains were fully given, showing that expansion joints are used, which are fixed at every 100 feet to 150 feet, as well as one where the main changes direction, and of the special connection used in coupling the pipes together. Service-boxes to supply three houses are fixed under the footpaths, which are connected to the mains by a pipe 1 inch in diameter. From these boxes the house supply is taken by means of copper pipes ¼-inch to 1 inch in diameter. At the end of the copper pipe, and inside the house is fixed a vessel, called a "converter," whose use is to permit the water to resolve itself into steam, the pressure of which is controlled by means of a reducing valve fixed on the copper pipe before it enters the converter. From this converter the house services are taken. If a supply of both heat and power is required, double, or compound, converters are used, with two reducing valves, the power being taken from one and the heat from the other. The pumping and boiler capacity of the central station were given, together with the latest additions to insure economy of labor. The paper concluded with the hope expressed by the author to see a successful central supply of heat and power system adopted in that country, and his thanks to Mr. A. V. Abbot, chief engineer to the Boston Heating Co., for his kind assistance in giving all possible data on the subject.

Sir Frederick Bramwell said the question of the transmission of heating power was becoming more and more important every day. So far as they knew, there were three undoubtedly practical modes of doing it. One was this mode, by high pressure water. The other was the New York mode, by steam at comparatively moderate pressure; and the third was the mode with which they were so familiar here—by gas. Whether the electricians in future would give us electricity at so cheap a rate that we could afford it for the purpose of heating, he did not know. It appeared from a newspaper report that one electrician had obtained it with waste water power, and applied it for cooking purposes. But that was an exceptional case, and it seemed to him that they were restricted to these three modes, and it would be a very desirable thing that there should be a paper read before that section which would give, in a compendious mode, the cost of the installation of a system to deliver heat, another to deliver power, and another to deliver them jointly. As far as he had been able to make out from a paper that was read at the Civil Engineers some few months ago, upon the New York system, the provision of steam did not compete favorably with that of gas, at the price at which we obtained it in England, although it competed most favorably with the price prevailing in New York.—[Colliery Engineer (London).

DESIGNS for the London Eiffel Tower projected by the company at the head of which is Sir E. Watkin, will be thrown open to competition. Two prizes of 500 guineas and 250 guineas will be offered for the best and second best designs for the tower, and competitors can obtain specifications on the 1st prox. The plans must show a tower 1,200 feet high, and give estimates of the weight of material, the cost of lifts and labor.

A Pennsylvania Road 2,500-ton bridge, 258 feet long, was moved 45 feet in 12 minutes.

THE WOODBURY-MERRILL AIR ENGINE.

The engine is constructed with two operating or "working" cylinders, and two other cylinders called "reversers;" each reverser is provided with a reverser heater, placed within a furnace; a regenerator, consisting of wire cloth of large, superficial area, extending from the cooler to the bottom of the reverser heater; a cooler, consisting of a large number of thin, copper tubes surrounded by water, and a displacer piston, having metallic packing rings, and adapted to reciprocate within the cooler. Each working cylinder is provided with a working piston having metallic packing rings. Each reverser is connected by means of pipes with the working cylinders as follows: The hot chamber below the displacer piston is connected with the bottom of the working cylinder directly opposite, and the cold chamber above the displacer piston is connected with the top of the working cylinder diagonally opposite. The means employed of converting the reciprocating motion of the pistons into a rotating motion are all of the common type. A small single acting air pump, having a leather packed piston, is operated by an eccentric fastened to the main shaft. The pump is used to compress the air to the initial pressure required, and to maintain this pressure, which is subjected to a loss by leakage around the piston rods. The regulation of the speed is obtained in a simple manner by the adaptation of a common centrifugal governor.

The power produced is due to the energy exerted upon the working pistons by the alternate raising and lowering of the temperature of the same mass of air within the reversers. When sufficient heat has been imparted to the reverser heaters, by the combustion of any kind of fuel within the reverser furnaces, the engine may be started by the use of the compressed air (previously compressed into a small reservoir) admitted into the engine in an alternate manner, similar to the starting of a Corliss engine, by means of starting valves. The cooling medium used is any kind of water, or a blast of air circulated through the coolers. A very small quantity of water is required, and the same water may be used over and over again.

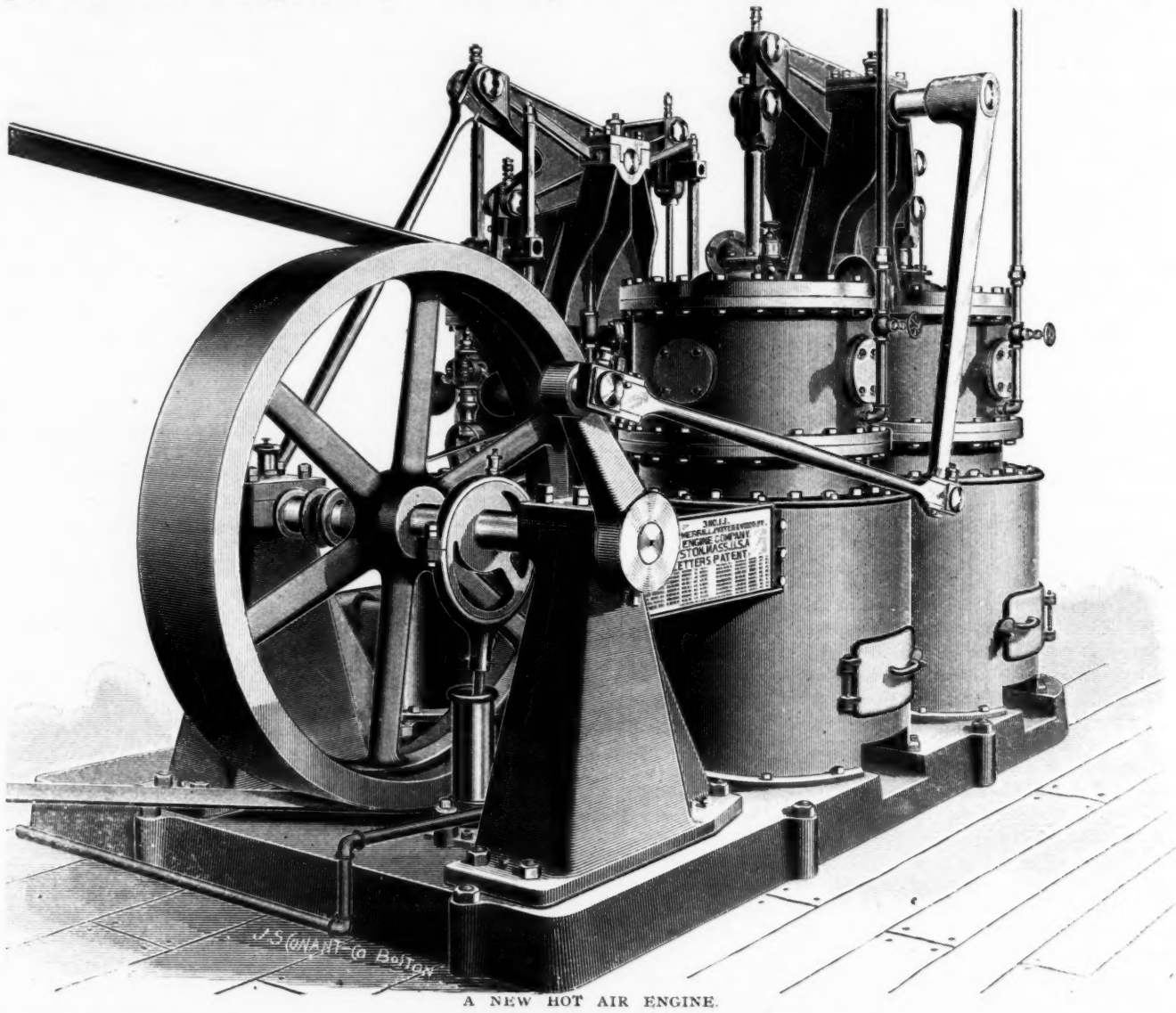
This improved air engine is not an exhausting engine, like the steam engine. It uses the same mass of air over and over again, simply expanding and contracting it by alternate heating and cooling, and thus generates a power in accordance with the well-known laws of the expansion of gases, which power is developed by the working cylinders. It has neither admission nor exhaust valves, and its motion is as regular and uniform as the best steam engines. It is an absolutely safe power producer, and there is no possible danger from explosions or ruptures. It will run as long as it is fed with fuel, and when the fire goes out, will stop. That is all the danger there is to it.

The accompanying engraving is an elevation of No. 13 air engine, in operation at the works of the Downer Kerosene Oil Co., West First street, South Boston, Mass. Recently a series of tests were made by George H. Barrus, M. E., to determine the economy as to consumption of fuel with which the engine works. The following is a brief summary of the principal results:

"On all the tests except the last, the principal load on the engine consisted of a No. 35 Sturtevant exhausting fan, with 72-inch case which makes 535 revolutions per minute when the engine makes 110 revolutions per minute. On the last test, the principal load consisted of the same fan, and in addition, a Sturtevant fan, with 60-inch case, No. 123, which made about 625 revolutions per minute. The friction of the engine was determined by subtracting the average power absorbed by a pony brake, applied to the fly-wheel, from the indicated horse-power developed at the same time, on the occasion of supplementary tests, a part of which were made March 7th, and a part March 22d, the number of these tests being fourteen. The average indicated horse-power was 31.18 and the average brake horse-power, 19 92."

"It appears from the table, taking the test of March 23rd as a proper indication of the performance of the engine, that the amount of coke used in a ten-hours' run including the wood and coke required to start the fire, beginning with a cold engine, was 1.91 lbs. per indicated horse-power per hour, and 2.98 lbs. per brake horse-power per hour. On the same test, for a period of 6¼ hours, after the engine had attained its normal conditions of work, the quantity of coke consumed was 1.54 lbs. per indicated horse-power per hour, and 2.37 lbs. per brake horse-power per hour. During the test of March 6th, the quantity of water which passed through the coolers amounted to an average of 3,612 lbs. per hour, which is equivalent to 7.2 gallons per minute. This water was supplied at a temperature of 36 degrees, and discharged at a temperature of 102.8 degrees."

"I do not regard these results as the best that can be obtained from the engine, for there is a considerable loss of heat from the unprotected exterior surface of the furnaces, due to radiation, which can easily be prevented by the use of suitable covering."



A NEW HOT AIR ENGINE.

KIND OF FUEL.	*GAS HOUSE COKE.				George's Creek Cumb'r'd Coal.
Date of Test. 1889	Mar. 5.	Mar. 6.	Mar. 23.	Mar. 23.	Mar. 25.
Duration.....hrs	7.	8.25	10.	6.25	5.
Condition of fire at beginning and end	Normal.	Begin with New Fire. End with Fire burned out.	Begin with New Fire. End with Fire burned out.	Normal.	Normal.
Weight of dry fuel burned, including 4-10 of weight of wood used for lighting fire.....lbs	342.	453.6	601.6	314.	262.
Weight of dry fuel burned per hour.....lbs	48.9	55.	60.2	50.	52.5
Indicated H. P. developed by engine I. H. P.	30.16	29.68	31.45	32.38	32.43
Revolutions per minute	113.1	112.4	112.5	113.6	108.4
Fuel burned per I. H. P. per hour lbs	1.62	1 85	1.91	1.54	1.62
Fuel burned per Brake H. P. per hour, assuming friction of 11.26 H. P.	2 59	2.99	2.98	2.37	2.48

"Taking the results as they stand, however, the consumption of fuel per effective horse power transmitted through the belt, is not more than one-half

*On the test of March 5th, the coke, when fired contained 20 per cent. of moisture, and on that of March 6th 14.2 per cent. of moisture, determined by drying samples. On the test of March 23d, the coke when fired was dry.

of that required for the best non-condensing steam engines of small power, which are commonly used."

The inventors of this engine are Messrs. Jas. A. Woodbury, Joshua Merrill, George Patten and Edward F. Woodbury, of Boston, and for more than 35 years these gentlemen, or some of them, have been engaged in its projection, so to speak. They were the first Americans to patent an air engine in this country or in Europe, their first patents being dated 1853. Further information may be obtained from Joshua Merrill, treasurer of the Woodbury, Merrill, Patten & Woodbury Air Engine Co., 8 Exchange Place, Boston, Mass.

A BARB-WIRE AND NAIL TRUST.

The Pittsburgh *Dispatch* announces a barb-wire trust. It is to be known as the Federal Steel Co., and the *Dispatch* says of it:

The Oliver & Roberts Wire Co., of this city, Carnegie Phipps & Co., of Beaver Falls, the Gautier Steel Department, at Johnstown, and the Braddock Wire Co., at Braddock, Pa., are now engaged in taking stock in their plants preparatory to selling out to the new combination. The latter will be known as the Federal Steel Co. and will be a chartered corporation.

It is proposed to have it chartered either under the laws of New Jersey or Illinois, but this point has not yet been settled. Some of those forming the company say the laws of Illinois will give them greater advantages than any other State, while others hold a New Jersey charter would probably be the best. In conversation with George T. Oliver yesterday, the gentleman stated that they had put a price upon their plant and would turn it over to the new company. The plan of the latter is to pay either in cash or stock for every large wire mill in the country they wish to control. The Pittsburgh concern will go in and take stock in the company. Some of the stockholders who do not favor the combination will be paid cash for what they now own in the companies.

As soon as permanent officers are elected the company will open offices in this city, and the clerical forces in the other offices be dispensed with. This matter of economy was the chief cause of the combination. It is very probable that John W. Gates, of St. Louis, Vice-president of the Braddock Wire Co., will be the president.

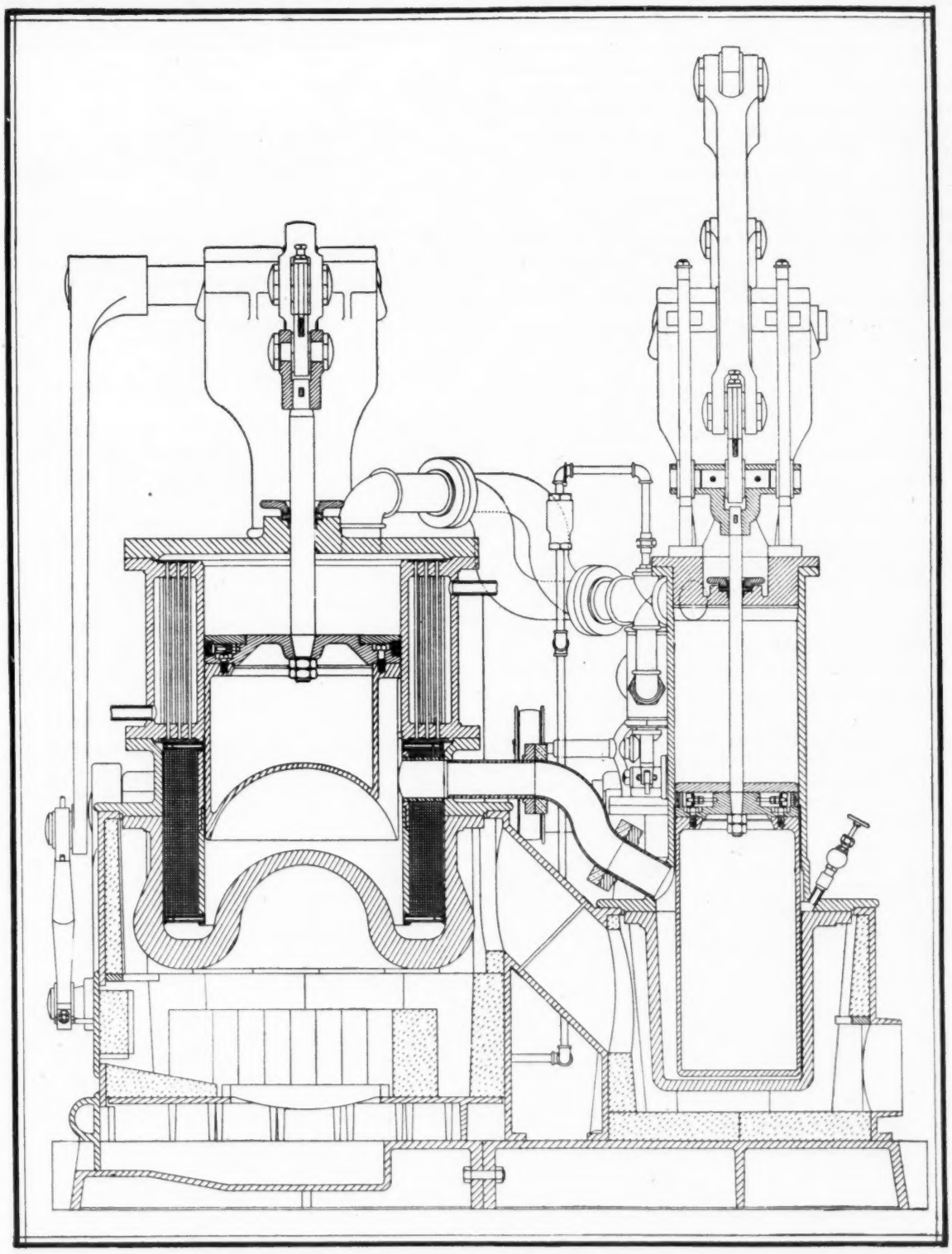
In speaking of the matter, Mr. George Oliver was loth to give the real nature of the combination. When asked if it was not true that he and others in this vicinity were taking stock to sell out to the Federal Steel Co., he said:

"Yes, it is true that there is a scheme on foot to buy up all the large wire plants in the country for the purpose of combining the business and thus reduce expenses. We have gone so far as to place a valuation on our mills and will be paid in cash or we can take stock in the general concern. The new company, for which there will be a charter issued in a few days, will buy outright any large concern in the United States which may be thought advisable to purchase. It is not intended to have all the wire manufacturers in the company, and for that reason a number of the small concerns will be left out. There is sufficient capital behind the scheme to buy up all the mills in the country if necessary. There will be no effort made to squeeze anybody out of the business. Those who do not wish to come in can go along doing business as usual, and we will not meddle with them. It is not our intention to build up a monopoly, but find that it is to the best interest of the business to go into the combination. When the subject was first broached to our company we refused to go in. We were afterward convinced that it would pay us to do so and are now ready to sell out. We were averse to going into any pool. The others showed us that it was to our advantage, and as it is a straight business transaction, we are going in. I do not know anything about the other plants about here, but think they will also join."

"Will Washburn & Moen, the large concern that fought everybody about infringing their patent, be in the new company?" was asked.

"No. They were not asked to come in. It was the intention to confine the combination to Western companies. The concern you mention is in Massachusetts. No, it is not yet settled what the capital stock will be, but it will run into millions. A conference was held in Chicago last week, but this was not determined." From another source it was learned that there was considerable opposition to the new company, and there is a strong probability that the manufacturers will also form a combination to compete with the large mill owners. It was stated that Washborn & Moen would go in with the others and try to break the Federal company. The small producers of wire and nails who were not taken in the large combination expect that they will forced to sell their plants to the big concern. It is also understood that the latter has offered them what they consider a low price for their works. This has been refused and the owners think that sooner or later they will have to accept them. To offset the effects of the Federal combination, the small manufacturers have taken the initial steps to form a combined company of their own. They have gono so far as to make an offer to two large Bessemer manufacturers for the latter to build a plant. They agreed to take the product of the mills to be used to make wire for some years.

They failed in this and now express an intention and their ability to work up such a granger sentiment throughout the country as will secure a reduction in the tariff on wire rods at the next session of Congress, and thus defeat the aims of the syndicate to monopolize the barb wire business of the country. They cite the results of their efforts in 1883, when they had the duty on wire rods reduced by "working" the Western farmers. Such a large reduction was then made that they claim they can do it again. There is in the neighborhood of 200,000 tons of barbed wire manufactured annually. It is worth about $75 per ton.



A NEW AIR ENGINE—SECTIONAL ELEVATION.—See opposite page.

BELLITE was recently employed in connection with some blasting operations at the Westport Harbor Works, New Zealand, with highly satisfactory results. A charge of 200 lbs. of the explosive was placed in a chamber cut in a mass of rock weighing some 1,800 tons, which had been previously loosened on three sides. The discharge broke up the whole of the rock desired into convenient masses, and it is computed that about 2,200, instead of 1,800 tons were brought down by the explosion. It is stated that a smaller charge would have answered quite as well, as the expansion of bellite is slower than that of dynamite.

A SHIP canal between Edinburgh and Glasgow to cost $35,000,000 is urged.

FIRST IRON WORKS IN AMERICA.

In the November issue of the *Magazine of American History*, Nathan M. Hawkes, of Lynn, contributes a very interesting paper describing the location of the first iron works in America, and the formation of the company which established them, with copies of the grants issued by England at the time.

As the iron industry in America is, at the present time, one of the largest and most extended of our industries, it is interesting to note some things in connection with its history and growth, and also to learn where and when it had its beginning, which is very pleasantly described by Mr. Hawkes, as follows:

"Verily there is nothing new under the sun in the laws of nature or of trade. The present large impetus of English capital into this country only marks afresh a movement that has existed since the very beginnings of the Western Continent. There is something stimulating in the contact of an old race with a new soil. English capital was seeking investment when the Puritans took possession of Massachusetts Bay. In this marvelous age of iron it will be interesting to note a few incidents in the history of the first iron works in America.

"Midway between Salem and Boston, the first and second capitals of Massachusetts, there flows a serpentine little stream called the Saugus by the Indians, and their English successors. From an elevation it resembles a string of 'uppercase' letter S's. Tide water meets the down-flowing fresh water two miles from the bay, between Round Hill on the west, and the dark forest on the east Just where the currents lap each other, on the bank of the stream, is a long, sloping mound like a sea-serpent's back, which to the passer-by seems but a freak of nature. The hand of man, however, wrought that earthwork. At this point was the upper ferry crossed, in the early days, by Endicott and Winthrop, and all the Puritan worthies, in the infancy of New England.

"The mound which lies at this point upon the river bank, and is known to the natives as the 'Cinder Banks,' is the heaped-up scoria, the refuse, the remainder, the sweepings of an iron foundry, which was in full blast before the red man had cast his last, lingering look upon his beloved river, and upon the blue waters of the Atlantic beyond. The fleecy snows have mantled it, the sun has scorched it for two centuries, and only an occasional curious observer has disturbed its scanty covering of vegetation for some relic of the first manufacturing industry of the continent.

"The existence of iron ore about Lynn had been known from the first settlement. The presence of the ore and the want of iron tools, combined, in the year 1642, to send one of the enterprising settlers of Lynn, Capt. Robert Bridges, to London, with specimens of the ore, in the endeavor to enlist English capital. He succeeded in forming a company, called the 'Company of Undertakers for the Iron Works.'"

This company was composed of eleven men, all Englishmen, as undertakers, or, as we call them, stockholders, who advanced £1,000 for commencing the works, and whose names are given in the article. John Winthrop, Jr., son of Gov. Winthrop, was also interested. The village at the works, says the article, "was called Hammersmith, from some of the principal workmen, who came from a place of that name in England. Capt. Bridges and the undertakers did more than to establish the first iron works in America; they brought to the infant colony men who, at home, would have been mere skilled artisans, but here the necessities of a new world brought out dormant genius from the brains of inventors, of whom Joseph Jenks was a type, and who were the forerunners of Morse in the last generation, and of Edison in this."

The Mr. Jenks here mentioned was the inventor of an improved scythe, for which he received a patent from the English Government. He was also interested in other inventions, and was the father of Joseph Jenks, one of the first governors of Rhode Island, and founder of the iron industry in that state, as well as the founder of the Jenks family, who have always held a prominent place in the history and development of Rhode Island.

Among the other prominent men who were associated in the industry as above located and described, was Major Samuel Appleton, who became one of the proprietors in 1678, and Mr. Hawkes says, in speaking of that time "Above the ferry a dam was built across the river, higher even than the present dam, which flows several hundred acres and furnishes water power for several woolen mills. It is estimated that the company owned about 3,000 acres of iron mill land. The works were in active operation in 1643, and from frequent mention in the colonial records, and by the liberal rights, privileges and exemptions granted them by the general court, seem to have been anxiously nourished as the leading or only manufacturing industry for quite a number of years. Gov. Winthrop, under date of August 4, 1649, writes to his son: 'The iron work goeth on with more hope. It yields now about seven tons per week, but is most out of that brown earth which lies under the bog mine.' In another letter, September 30, he says: 'The furnace runs eight tons per week and their bar iron is as good as Spanish.'"

Following this is a copy of the grant issued by the English Government, which shows the liberality of the general court in those days in favor of a foreign plant.

In closing the article, the writer says: "These iron works flourished, as all enterprises did in England and the colonies so long as the commonwealth and Cromwell lived. Then they went on, after a fashion, in the hands of private individuals during the reigns of Charles II. and James II., or, till the revolution of 1688, when New England commenced a freer life, and the iron works were of no further public concern. The works embraced a blast furnace, or foundry, and a refining forge. The term foundry was then a synonym for furnace, castings being made directly from the furnace. It has been claimed that the many lawsuits, in which the company became involved with the landowners, in consequence of flowage, had much to do with the discontinuance of the works. A more reasonable assumption is that better iron and more of it was discovered elsewhere, and that the supply in this region was exhausted. The iron, however, had gained a foothold in the New World, and the craftsmen, with their deft hands and teeming brains, were ready for broader scope, for Pittsburgh, for Wilmington, and now for Sheffield, Ala. It seems that Puritan intellect in the early days was not, as the vulgar suppose, devoted entirely to witchcraft and the blue laws, but then, as now, was first in the field of invention and material progress."

WROUGHT STEEL PIPE HOOKS.

Illustration is herewith given to the "Never Break" Wrought Steel Pipe Hooks, just brought out by the Bronson Supply Co., of Cleveland, whose novel hardware specialties are making such rapid headway in the market. Fig. 1 shows a combined pipe hook and expansion plate, Fig. 2 a combined ring plate and pipe hook. To make an expansion plate out of any hook, all that is

FIG. 1.

FIG. 2.

necessary to do is to take a hammer and straighten out the hook. To make a ring plate out of a crooked pipe hook, it is simply necessary to take a hammer and bend the point of the hook over the top of the pipe, after the pipe is in place. These specialties are made entirely of wrought steel, and the prices are as low as for cast iron hooks.

NATURAL GAS FREE FOR MANUFACTURERS.

Muncie, Ind., is making a bid for manufacturing industries, and to those who consume a large amount of fuel, the inducements are certainly tempting. This flourishing manufacturing city is centrally located, being 227 miles from Cleveland, 200 from Chicago, 110 from Cincinnati and 275 from St. Louis. Three lines of railroad cross here, making six inlets and outlets to the city, and giving Muncie splendid shipping facilities and low freight rates.

Pig iron can be brought from the Birmingham (Ala.) district fifty cents per ton cheaper than to Cleveland or Fort Wayne, and sixty-five cents cheaper than Chicago. Natural gas is found there in abundance and it is claimed to be the field best in the world. Over forty mighty gas wells pour forth nearly 100,000,000 cubic feet of gas every twenty-four hours, and the gas territory around Muncie is large enough to supply 200,000,000,000 feet per day, if it should be required.

Over twenty new manufactories have located there during the past two years, among the most prominent of which is the Muncie Nail & Iron Co., employing 310 hands and saving $40,000 annually in fuel. This plant was moved from Greencastle, Ind., about a year ago, and is now running day and night to fill orders. The Muncie Pulp Co. employs 100 men and saves $35,000 yearly in fuel over former methods. There are six glass manufactories, ten stamping works and many other large industrial establishments, such as the Indiana Bridge Co., the chilled plow works, binding works, bagging mill, besides a score of smaller concerns.

It is estimated that the manufacturers are saving $250,000 annually in fuel, and the householders about as much more. Mr. James F. Doonell, president of the nail works, says he is making a nail out of pig iron that experts can hardly tell from steel.

The Muncie Natural Gas Land Improvement Co. was organized last Spring with Leon Abbett, governor of New Jersey, as president. This company offers splendid manufacturing sites on the line of the railway, and natural gas for fuel and light free to manufacturers locating there. Rolling mills, wire mills, nail works, shovel works, or any kind of industry using large quantities of fuel will find it well worth the trouble to investigate this offer. Full particulars can be had by addressing E. G. Rideout, General Manager of the above named company, at Muncie, Ind.

Iron Furnace Horror.

One of the most horrible accidents ever known in that vicinity occurred at the Colebrook furnaces, Lebanon, Pa., November 4 On the Saturday evening previous, the iron broke out in the hearth of furnace No. 1, and was checked with great difficulty. Tuesday evening, while ten men were engaged in breaking the large mass with block and fall, the molten metal, without a moment's warning, broke forth again. The livid iron poured in all directions, and was thrown up thirty feet in the air. The workmen were immersed in a sea of liquid metal. William Snyder, Isaac Seigrist, Harvey Bohr, Harvey Beck and Henry Fertig were completely covered and burned to a crisp. John Bohr had both his hands and feet so severely burned that his life is despaired of. Enoch Eisenhower was so severely burned that he cannot recover, and Benneville Eck cannot recover. E. A. Tice and Henry Foreman, who were working on the top of the mantel, jumped to the roof of the stock house, and were the only two out of the ten who escaped. They were severely burned.

ACCORDING to a correspondent of the *St. James' Gazette*, the idea of the switch-back railway being a modern invention is entirely erroneous. He supports this contention by reference to Moore's "Epicurean," a novel relating to the third century, published in 1827, in which a remarkable account is given of a ride on a switch-back taken by the hero in an Egyptian desert.

INDUSTRIAL SUMMARY.

New Enterprises:—

The Northwestern Wind Engine Co., of Minneapolis, with a capital stock of $10,000, has become incorporated.

New works are now building at Utica, N. Y., for the manufacture of cast iron pipe; they are to cost $60,000.

Negotiations have been concluded between Aurora real estate men and Chicago capitalists, whereby the latter are to erect a large agricultural implement factory at Aurora at once.

The Improved Nut Lock Co., of Winchester, has been incorporated with an authorized capital stock of $100,000 to manufacture a patent nut lock. The incorporators are: W. M. Grisham, F. M. McClasson and B. F. Wilmot.

A corporation known as the Hecla Iron Co. has been organized in Pittsburgh and a charter will be applied for next month. The incorporators will be Charles E. Morrows, Thomas W. Hodkinson, Charles L. Crawford, Edwin W. Smith and George B. Motheral, all of Pittsburgh.

The Secretary of State of Illinois has issued the following licenses of incorporation: Bear Spring & Dover Iron Co., of Chicago, for general manufacturing and mining purposes; capital stock, $350,000; incorporators, D. R. McFadon, J. P. Gardner, A. D. Curier.—The "Y" Improved Nail Co., at New Swansea, to manufacture, buy and sell nails; capital stock, $25,000; incorporators, B. York, L. N. Muren and Adam Karr, Jr.—Federal Steel Co., of Chicago, to do a general manufacturing business in steel and iron, capital stock, $12,000,000; incorporators, James H. Moore, W. A. Purcell and D. W. McCaughey.—Shaffer Iron Co., of Chicago, to do a general mining and manufacturing business; capital stock, $1,000,000; incorporators, Charles Himrod, Kirk Himrod and C. S. Willettes.—Chicago Machine Works (limited), to manufacture machinery; capital, $500,000; incorporators, A. F. Smith, F. D. Smith, C. L. Scheiffein.—Chicago Electric Railway Co, to operate horse and dummy railways; capital stock, $1,000,000; incorporators, O. M. Brady, L. P. Hicks, Charles F. Swigart and others.

Enlargements, Additions, Removals, Etc:—

The Carroll-Porter Boiler & Tank Co., successors to D. W. C. Carroll & Co., Pittsburgh, are building an extensive boiler and tank works. The officers are J. W. Porter, President; J. E. Porter, Secretary and Treasurer, and D. W. C. Carroll, General Superintendent. The works will cover about an acre of ground, the main building being 210 feet long and 81 broad, and constructed of iron and wood. Another building will be 40x200 feet. In every respect the works are being built to suit their special purposes, a notable feature being the tower, 70 feet high, intended to house the large steam riveter, which will be nearly double the size of any now in use. The latest and best machinery will be set up, inciuding bending rolls of the unusual length of 21 feet. It is intended to manufacture steam boilers, bridges, oil-tank cars, oil and water tanks, iron girders, iron and steel rivets and all kinds of sheet iron works. It will take some little time to get all the machinery in place, but the riveters, rolls, shears, cranes, etc., will be in operation by the beginning of the year 1890. The company will employ 200 men to start with.

Works Starting Up, Etc:—

The 24-inch mill of the National Tube Works Co., at McKeesport, Pa., which has been idle for some time, will be put in full operation at once.

The Homestead Mills of Carnegie, Phipps & Co. are to be enlarged at an early date, by the addition of eight open-hearth steel furnaces. The work of pulling down a number of old buildings to make room for the new plant is going on at present, and the plans for the improvements are about prepared.

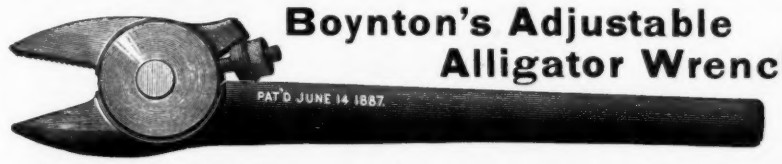
Fires and Accidents:—

Monday's dispatches contain a greatly exaggerated account from Tonawanda to the effect that the works of the Tonawanda Iron & Steel Co. were entirely destroyed by fire with a loss of $500,000. We are informed that an explosion of some molten iron set fire to the roof of the cast house, and burned a small portion of it, with a probable total loss of about $1,000, which is fully covered by insurance. The incident was so insignificant as hardly to merit mention.

General Industrial Notes:—

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 5th day of December, 1889, for all the labor and materials required to complete the iron work of the tower and dome of the U. S. Court House and Postoffice building at Denver, Colo.

Owing to the fact that many persist in directing their mail to "West Lebanon" (a village in Western Pennsylvania), instead of Lebanon, Pa., and also to the confusion caused of the similarity of the names of the several rolling mills of that city, the proprietors have decided to change the name from West Lebanon Rolling Mill Co., Limited, to the West End Rolling Mill Co., Limited. The capital, management, etc., remains the same as heretofore, the change being simply one of name.



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Muncie Natural Gas Land Improvement Company,

E. G. RIDEOUT, GENERAL MANAGER, MUNCIE, IND.

GERMANY'S EXPORT TRADE.

The British Consul-General at Frankfort has drawn a comparison between the exports of Germany, France, and Great Britain for the first six months of this and preceeding three years. These figures will cause some surprise when we consider the amout of attention we are given to bestowing upon German competition, for they show that German exports have been declining for the past three years, while those of France and Great Britian have been growing. In fact, with the three exceptions of sheet-iron, sewing machines and alizarine dyes, every class of German exports shows a loss in the first six months of this year over the the corresponding period in one or more of three preceding years; in some classes these losses are heavy. Her metal exports declined 15 per cent. from 1887. The largest fall was in pig-iron, the exports of which declined from nearly 1,200,000 double cwts. in January—June, 1887; nor was this falling off made good in any class of manufactured articles. These figures are taken from the *Frankfurter Zeitung*, which says, in the course of its comments upon them: "The industrial countries which principally compete with us were greatly astonished at our progress in the first half of this decade, but have made great exertions since then, as will be seen by the foregoing statistics; in many important branches they have come up with, and even overtaken us. * * * Only a gradual return to the commercial system which was the powerful basis of our industry till 1879 can remove the disadvantage of our present commercial situation."—[Ironmongery.

HORSE NAILS BY THE BUSHEL.

Some practical exhibitions of a novelty in the way of horse-nail-making machinery have recently been given in London, Eng. It is the invention of Mr. G. P. Capewell, and is an ingenious mechanical appliance for greatly increasing the rate of production. The entire process is automatic. A coil of wire is at the top, and one end being inserted, the machine is set in motion, and in a very few seconds a constant stream of finished nails come dropping out at the bottom. The following details of the work are, as stated, all carried out automatically. A short piece of wire is cut off and by a series of dies is drawn out to the required length; it is then beveled, pointed and headed. Each piece passes through a dozen operations consecutively, without the intervention of hand labor at any one of them. The machine is completely under control, and there is an arrangement by which it stops automatically if a nail fails to pass through any one of the operations. It is said that each machine will produce over 600 pounds of average-sized nails per day of ten hours. The nails produced were subjected to hydraulic tests, and the results are greatly in favor of the Capewell machine for producing strong nails of most perfect shape. There appears to be very little waste material, and we are told that this does not amount to 10 per cent. It is proposed to form a company to produce and work this machine in Great Britain.

SOME presses have 5000-tons power and will take the hammer's place.

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Those seeking new fields for manufacturing establishments should not fail to investigate **the wonderful development in Iron, Coal and Coke Industries that has been made within the past five years along the line of the Norfolk & Western Railroad, and the advantages offered by the State of Virginia in the supply of cheap raw materials, by the Norfolk & Western Railroad** in the matter of freight facilities and rates upon raw materials and for reaching home, far distant and foreign markets, and by the cities and towns along its line in the way of advantageous sites, at moderate cost. Many of the cities and towns exempt manufacturing establishments from taxation for a series of years.

For further information as to freight rates and sources of supply of raw materials, apply to A. POPE, General Freight Agent, Roanoke, Va., or to

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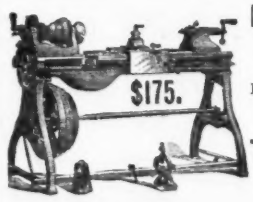

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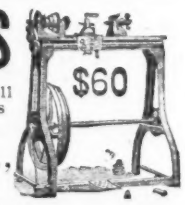

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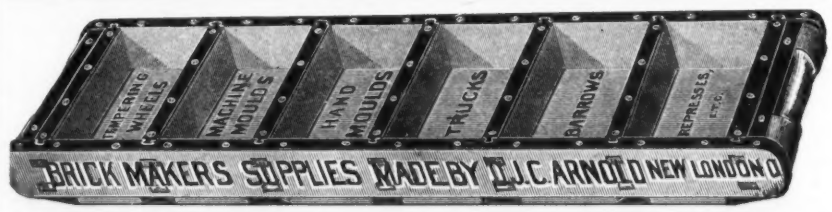

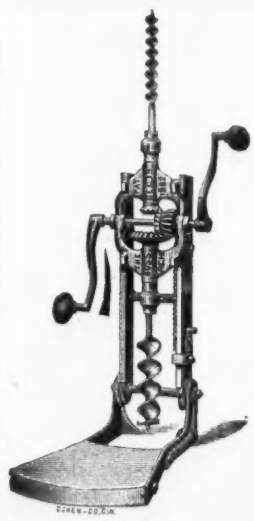

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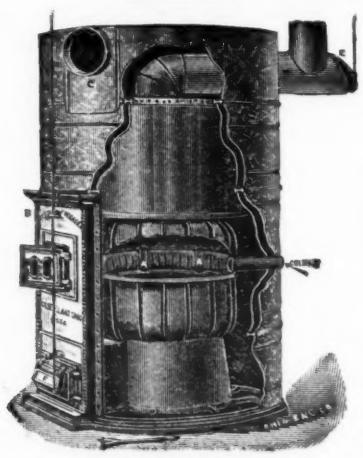

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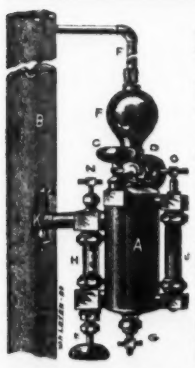

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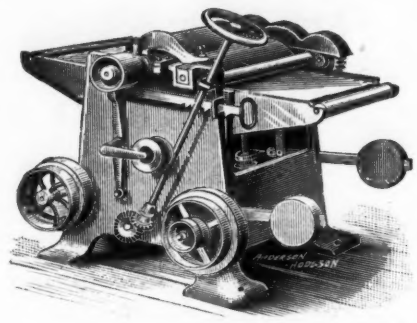

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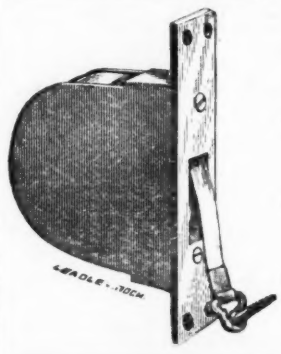

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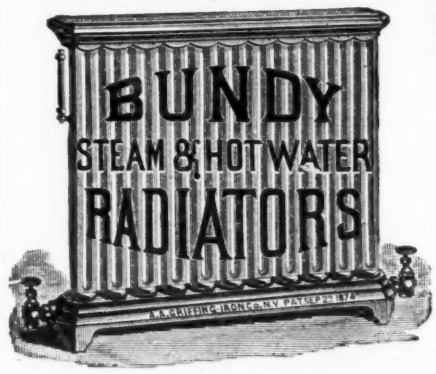

Steam and Hot Water.

10,000 pleased parties using an aggregate of over **12,500,000** square feet of Bundy Radiators attest to their superiority.

IF YOU DOUBT THIS

We will send the list and consider it a favor if you will write to the parties for their opinion.

Send for catalogue with new designs of **Arabesque** Radiators for **Oriental, Moorish** and other Queen Anne rooms.

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673 Communipaw Ave., Jersey City, N. J.

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L S. GRAVES & SON,

Corner Center and Frank Streets, Rochester, N. Y.

New York Office, 46 Cortland St.; Cleveland Office, 208 Superior St.

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MANUFACTURERS OF PATENT

BURGLAR ALARM DOOR KNOBS

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Burglar Window Alarms.

Cheapest, most Reliable and most durable Burglar Alarms on the Market.

Grand Arcade, Cleveland, O. Agents Wanted.

PARKER & MEIKLE,

Practical Steam Fitters and Plumbers.

High and Low Pressure, and Exhaust Steam Heating. All Sizes of Pipe Cutting a Specialty. Jobbing promptly attended to. Telephone 2260.

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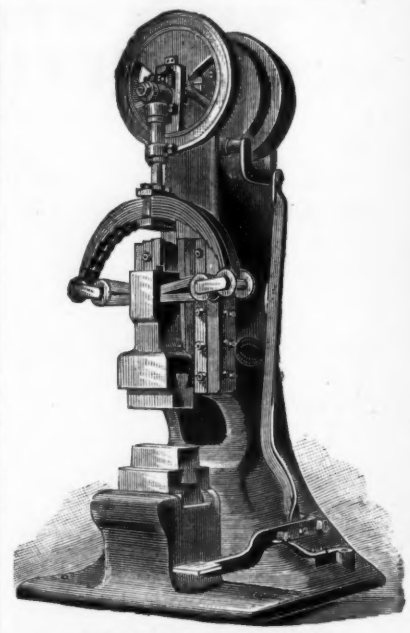

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"Dead Stroke" Power Hammer.

Made in 5 sizes. 15 lb. to 250 lb. Ram. Unequalled for die work and General Forging.

Philip S. Justice & Co., Philadelphia, Pa.

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Williams, White & CO.,

Moline, Illinois,

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The Forging and Bending Machine,

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DOUBLE AND SINGLE

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Justice Spring Hammer.

E. A. SCHUMACHER,

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Upright - Drills,

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Parkin & Bosworth Agent for Cleveland, O.

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Sydney, N. S. W.

THE SWEET & CLARK CO., Marion, Ind.

Manufacturers of REFINED AIR FURNACE MALLEABLE IRON.

Superior advantages on account of Natural Gas Fuel. Also manufacturers of Curry-Combs, Hardware and Saddlery Hardware Specialties. ☞ Write for Price List and Catalogue.

IRON AND STEEL MARKETS.

PIG IRON.

CLEVELAND (f. o. b. cars, four months): Bessemer, $19 00@19 50; No. 1 Foundry, $18 15@18 65; No. 2 Foundry, $17 15@17 65; No. 1 Gray Forge, red short, $16 65@17 25; No. 2 Gray Forge, neutral, $16 15@16 65; No. 1 American Scotch, $19 40@20 05; No. 2 American Scotch, $18 40@19 05.

CHICAGO (reported by Rogers, Brown & Co.): Southern Coke No. 1 Foundry, $17 50@00 00; Southern Coke No. 2 Foundry, $17 00@00 00; Southern Coke No. 3 Foundry, $16 50@00 00; Southern Coke No. 1 Soft, $17 00@00 00; Southern Coke No. 2 Soft, $16 75@00 00; Southern Grey Forge, $16 25@16 50; Ohio Silveries No. 1, $18 25@18 50; Ohio Silveries No. 2, $17 25@17 50; Ohio Strong Softeners No. 1, $18 75@19 00; Ohio Strong Softeners No. 2, $17 75@18 00; Lake Superior Charcoal Nos. 1 to 6, $20 00@20 50; Tennessee Charcoal No. 1, $19 50@00 00; Tennessee Charcoal No. 2, $18 50@00 00; Southern Standard Car Wheel, $24 00@00 00; Tennessee Standard Car Wheel, $19 00@00 00; Hanging Rock Standard Car Wheel Cold Blast, $26 00@28 00; Hanging Rock Standard Car Wheel Warm Blast, $22 00@24 00.

CINCINNATI (reported by Rogers, Brown & Co.): HOT BLAST FOUNDRY—Ohio and SouthernCoke No. 1, $16 50@17 00; Ohio and Southern Coke No. 2, $16 00@16 50; Ohio and Southern Coke No. 3, $15 50@15 75; Ohio Soft Stone Coal No. 1, $17 25@18 00; Ohio Soft Stone Coal No. 2, $16 25@17 00; Hanging Rock Charcoal No. 1, $20 00@22 00; Hanging Rock Charcoal No. 2, $19 00@21 50; Tennessee and Alabamba Charcoal No. 1, $18 50@19 00; Tennessee and Alabama Charcoal No. 2, $17 00@18 00. FORGE—Strong Neutral Coke, $15 50@15 75; Mottled Neutral Coke, $15 00@00 00; Cold Short Coke, $15 25@00 00. CAR WHEEL AND MALLEABLE—Southern Car Wheel, $23 00@24 00; Hanging Rock Cold Blast, $22 00@25 00; Lake Superior Malleable and Car Wheel, $20 00@21 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $17 00@17 50; Southern Coke No. 2 Foundry (new classification), $16 50@17 00; Southern Coke No. 3 Foundry (new classification), $16 00@16 50; Grey Forge, $15 50@16 00; White and Mottled, different grades, $14 25@15 25; Silver Grey, different grades, $15 00@16 00; Southern Charcoal No. 1 Foundry, $17 50@18 00; Southern Charcoal No. 1 Mill, $16 00@16 50; Southern Car Wheel, Standard brands, $23 00@24 00; Southern Car Wheel, other brands, $18 75@21 25; Hanging Rock Coke No. 1 Foundry, $17 50@18 00; Hanging Rock Charcoal No. 1 Foundry, $21 50@22 00; Hanging Rock Cold Blast, $23 50@25 50; Hanging Rock Warm Blast, $00 00@00 00.

LOUISVILLE (reported by Hall Bros. & Co.): HOT BLAST FOUNDRY—Southern coke No. 1, $16 00@16 50; Southern coke No. 2, $15 50@15 75; Southern coke No. 3, $15 25@15 50; Mahoning Valley (Lake ore mixtures), $19 00@19 50; Southern charcoal, No. 1, $18 00@18 50; Southern charcoal, No 2, $17 50@18 00; Missouri charcoal, No. 2, $18 50@19 00. FORGE—Neutral coke, $15 00@15 25; Cold short, $15 00@15 25; Mottled, $14 00@14 50. CAR WHEEL AND MALLEABLE—Southern (standard brands), $23 00@23 75; Southern (other brands), $19 00@19 50; Lake Superior, $22 00@22 50.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $17 50@18 00; Southern Coke No. 2, $17 25@17 25; Southern Coke No. 3, $00 00@16 50; Southern Grey Forge, $00 00@16 50; Southern Charcoal No. 1, $18 50@19 00; Southern Charcoal No. 2, $17 50@18 00; Missouri Charcoal No. 1, $18 50@19 00; Missouri Charcoal No. 2, $17 50@17 00; Ohio Softeners, $19 00@20 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $22 00@23 00; Southern, $19 00@24 00. CONNELLSVILLE COKE—East St. Louis, $5 25; St. Louis, $5 40.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $19 00@00 00; Mahoning and Shenango Valley strong, No. 2 Foundry, $18 00@00 00; Niagara No. 1, $19 00@00 00; Niagara No. 2, $18 00@00 00; Niagara No. 3, $17 25@00 00; Ohio Softener No. 1, $19 25@00 00; Ohio Sofener No. 2, $18 25@00 00; Lake Superior Charcoal, $21 00@00 00; Tennessee Charcoal, $19 50@20 00; Southern Softener No. 1, $18 25@00 00; Southern Softener No. 2, $17 50@00 00; Alabama Car Wheel, $25 00@25 25; Hanging Rock Charcoal, $24 00@00 00.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $20 50@20 00; Lake Superior Charcoal, Bessemer, $21 00@22 00; Lake Superior Coke, all Ore $20 00@21 00; Lake Superior Coke, Cinder Mixed, $18 25@18 75; Standard Ohio Black Band, $20 00@21 00; Southern No. 1, $18 25@18 50; Southern Gray Forge, $16 25@16 50; Southern Silvery, $16 50@17 00; Jackson County (Ohio) Silvery, $19 25@19 75; Old Wheels, $19 00@19 75; Old Iron Rails, 25 00@25 50.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $18 50@18 75; No. 2 Foundry, $17 50@17 75; Grey Forge, $16 75@17 00; White and Mottled, $15 50@15 75; Warm Blast Charcoal, $18 00@22 00; Cold Blast Charcoal, $24 00@28 00; Bessemer, $20 00@21 00.

MERCHANT IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 80
4¼ to 6 by ⅜ to 1 inch	1 90
1¾ to 6 by 1⅛ to 2 inch	2 20
1¼ & 1⅜ by ⅜ to ¼ inch	1 90
1 & 1⅛ by ⅜ to ¼ inch	1 90
⅝, ¾ and ⅞ by ⅜ to ⅝ inch	2 30

Round and Square.

1 to 1⅞ inch	1 80
2 to 2⅝ inch	2 00
2¾ to 3¼ inch	2 30
3⅜ to 4 inch	2 80
4¼ to 4½ inch	3 30
4¾ to 5 inch	3 50

Oval.

⅞ to 1¼ inch	2 20
⅝ to ¾ inch	2 40
½	2 60
⅜	3 00

Half Oval and Half Round.

1½ to 3 inch	2 90
⅞ to 1¼ inch	2 50
⅝ to ¾ inch	3 00
½	3 30
⅜	4 80

Heavy Band.

1½ to 6 by ¼ and 5-16 inch	2 00
to 1⅜ by ¼ and 5-16 inch	2 10
¾ to ⅞ by ¼ and 5-16 inch	2 30
½ to ⅝ by ¼ and 5-16 inch	2 80

Hoops.

1¼ to 4, Nos. 13 to 15	2 65
1¼ to 2, Nos. 16 to 18	2 75
1¼ to 2, No. 19	2 85
1¼ to 2, No. 20	2 95
1¼ to 2, No. 21	3 05
1¼ to 2, No. 22	3 15
15-16, 1 and 1⅛, Nos. 13 to 15	2 85
15-16, 1 and 1⅛, Nos. 16 to 18	2 95
15-16, 1 and 1⅛, Nos. 19 and 20	3 05
15-16, 1 and 1⅛, No. 21	3 15
15-16, 1 and 1⅛, No. 22	3 35
⅞, Nos. 13 to 15	2 05
⅞, Nos. 16 to 18	2 15
⅞, Nos. 19 and 20	2 25
⅞, No. 21	3 35
⅞, No. 22	3 45
13-16, Nos. 13 to 15	3 25
13-16, Nos. 16 to 18	3 35
13-16, Nos. 19 and 20	3 45
13-16, No. 21	3 55
13-16, No. 22	3 65
¾, Nos. 13 to 15	3 35
¾, Nos. 16 to 18	3 45
¾, Nos. 19 and 20	3 55
¾, No. 21	3 65
¾, No. 22	3 75
11-16, Nos. 13 to 15	3 55
11-16, Nos. 16 to 18	3 65
11-16, Nos. 19 and 20	3 75
11-16, No. 21	3 85
11-16, No. 22	3 95
⅝, Nos. 13 to 15	4 05
⅝, Nos. 16 to 18	3 85
⅝, Nos. 19 and 20	4 05
⅝, No. 21	4 15
⅝, No. 22	4 25
⅝, No. 23	4 35

Light Band.

1½ to 6 by ⅛ to 3-16 in	2 25
1½ to 6 by Nos. 11 and 12	2 35
1 to 1¾ by ⅛ to 3-16 in	2 35
1 to 1¾ by Nos. 11 and 12	2 45
⅞ and 13-16 by ⅛ to 3-16 in	2 65
⅞ and 13-16 by Nos. 11 and 12	2 75
¾ and 11-16 by ⅛ to 3-16 in	2 95
¾ and 11-16 by Nos. 11 and 12	3 05
⅝ and 9-16 by ⅛ to 3-16 in	3 25
⅝ and 9-16 by Nos. 11 and 12	3 30
½ by ⅜ to 3-16 in	3 50
½ by Nos. 11 and 12	3 60

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 75
⅞ inch, " " " 13 and 14	3 05
¾ inch, " " " 11 and 12	3 05
¾ inch, " " " 13 and 14	3 25

Sheet Iron.

No. 10 to 14	2 60
No. 15 to 17	2 80
No. 18 to 21	2 90
No. 22 to 24	3 00
No. 25 to 26	3 10
No. 27	3 20
No. 28	3 40

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 40
C No. 1, " "	2 65
C H No. 1 " "	2 90
C H Flange, "	3 60
Extra Flange, "	4 00
Solid Fire Box, "	4 90

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 65
Shell	3 05
Flange	3 30
Marine Flange	3 80
Fire Box	4 45

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c ℔ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1¼c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s
1 to 2 in. inclusive	09
9-16 to ½ in "	09
7-16 to ⅜ and 2⅜ to 3 in	10½
3⅛ to 4 in	11
⅝ to 11-16 and 4⅛	10½
⅛ to 6 in	11½
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

	cts. ℔s
2 to 9-16 wide by 2 to ⅝ thick	0

CLEVELAND ROLLING MILL CO.,

MANUFACTURERS OF

BESSEMER STEEL RAILS,

Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel O Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

Bessemer and O. H. Steel.

	ct. ℔
Machinery	base price, 02¾
Tire	" 02¾
Spring	" 03¼
Sleigh Shoe	" 02¾
Toe Calk	" 03
Cutter Shoes, tapered and burr.	" 03

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

	NET TONS
No. 1 R. R. wrought scrap	$20 50
No. 1 wrought scrap	19 00
No. 1 Machine cast scrap	13 00
Pipes and Flues (clean)	23 00
Iron axles	24 00
Axle turnings	14 50
Wrought turning (free from cast)	13 00
Cast borings	9 00
Uncut wrought iron boilers	12 00
Steel boiler plates	13 00
Grate Bars	8 50
Pipes and flues (Clean)	12 75
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 00
Wrought drillings	11 00
Malleable iron	9 50
	GROSS TONS
Old iron T rails	24 00
Old steel rails	18 00
Old car wheels	17 00
Old copper	℔ 10
No. 1 H. red Brass	11
Heavy yellow brass	8½
Light yellow brass	6
Scrap Zinc	
Tea Lead	
Heavy Lead	3¼

DALLIBA, CORRIGAN & CO.,

DEALERS IN

Iron Ore & Pig Iron.

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J. H. OUTHWAITE & CO.,

Exclusive attention given to

LAKE SUPERIOR AND MENOMINEE RANGE

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Perry-Payne B'ld'g, Cleveland, O.

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CLEVELAND, OHIO.

Pickands, Mather & Co.,

IRON ORE - -

—AND—

- - PIG IRON

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CLEVELAND, O.

H. P. Hussey. Geo. H. Pomeroy.

HUSSEY & POMEROY,

EXCLUSIVELY PIG IRON,

Strong Foundry and American Scotch Irons, Gray Forge and Bessemer Irons for steel purposes.

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H. N. HILL & CO.

Iron and Steel.

REPRESENTING

LINDEN STEEL CO., L't'd. Steel Plate, Cold Condensed Shafting and Bar Steel of all kinds.

COBB & DREW. Norway Iron Rivets.

READING BOLT & NUT WORKS. Boiler Bridge and Ship Rivets.

TYLER STEEL TUBE CO. Steel and Iron Boiler Tubes. Locomotive Tubes a specialty.

813 PERRY-PAYNE BUILDING,

CLEVELAND, OHIO.

E. C. POPE,

COMMISSION DEALER IN

Iron Ore, Pig Iron

AND METALS.

Cleveland, - Ohio.

PITTSBURGH & WHEELING COAL CO.,

MINERS AND SHIPPERS OF

Ohio Steam Coal and Coke.

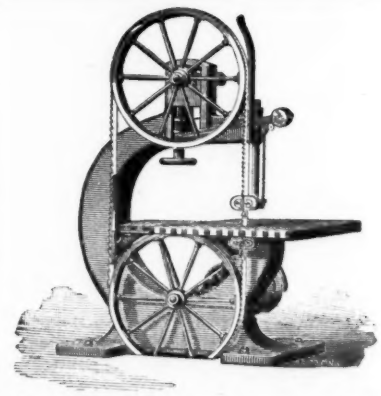
Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.

Office, 29 Mercantile Bank Building,

CLEVELAND, OHIO.

Lake Shipping Point, Lorain O.

JAS. PATTERSON, Sales Agent



$80 will buy the best No. 1 band saw in th world.

$100 will buy our new No. 2 band saw.

$185 will buy our new patent band re-sawing machine.

$100 will buy the best No. 1 automatic rip-sawing machine. Weatherboarding attachment included, and one 12-inch rip saw.

$125 our new No. 2 complete as above.

For further particulars address

STANDARD MFC. CO.,

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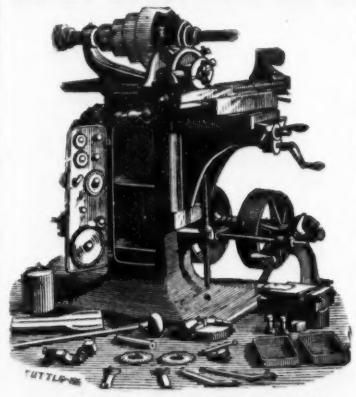
E. E. GARVIN & CO.,

Manufacturers of machinists' and iron workers' tools, lathes, planers, milling machines and drills. Special tools for all kinds of manufacturing to order



UNIVERSAL MILLING MACHINE.

Gear and Rack Cutting, Milling and Index Drilling to Order.

Laight & Canal Sts. NEW YORK.

MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 9½

Bellows.

Blacksmiths' { Hill's.....dis 40 / Bullock's.... dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70@70& 5
" " " extra.....dis 60&5@60&10
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard.dis 60&10
Shultz Raw Hide Leather Belting, single, ...dis 35&5
Shultz Raw Hide Leather Belting, double, and Light Double.....dis 35&5
Standard, oak tanned.....dis 55@60
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 9½@10½

Chalk.

White .....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 45
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers. .....dis 25
" Drill.....dis 35
Wescott's Scroll Combination.....dis 30
" Independent.....dis 40
" Little Grant Drill.....dis 30
Horton's Universal & Ind.....dis 40
National Combination.....dis 40
Sweetland " .....dis 40
Skinner " .....dis 40
" Independent.....dis 40
Almond Drill.....dis 25
Morse " .....dis 15
Skinner " .....dis 30

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Stocks.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1⅝".....dis 50&10
Morse Taper and Straight shank Larger than 1½".....dis 25
Drill Sockets.....dis 25
Standard.....dis 50&10
Cleveland.....dis 50&10
Maneer's bench.....dis 50&25
Maneer's post.....dis 50&10

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4¼c	5¼c		2¾c
¼ kegs ₩ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6¾c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 40@46
H. H. Barton.....dis 40@46

Emery Wheels.

Detroit.....dis 50@60
Norton's.....dis 55@60
Grant.....dis 55@60
Union Stone.....dis 60
Sterling.....dis 60
Vulcanite.....dis 15@20
Celluloid.....dis 10
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 65@70
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¼	3⅛
Hexagon	15½	11½	8½	6	5¼	5¼	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₩ lb add ½c., 1lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 70
Sheet Rubber.....₩ lb 12@24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 45

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ½ inch and over.....₩ lb 15¼
Sisal, ½ inch and over .....₩ lb 13¼

Sand Paper.

B. A. & Co.....dis 40@40&10
H. H. Barton's.....dis 40@40&10
New England Flint.....dis 40@40&10
Barton's Garnet.....dis 25

Saws.

Disston's Circular.....dis 45
" Band.....dis 20
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Cicular Saws.....dis 50
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 55
Machine, round head, iron.....dis 50
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ½ lb Balls		21c@29c
No. 18 " " ¼ and ½ "		18c@28c
No. 36 " " ¼ and ½ "		16c@27c
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine)		11½c
3-Ply " 1lb Balls		12@12¼c
3-Ply " 1½ lb Balls		11@11¼c
Cotton Wrapping, 5 Balls to lb		15@16c

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30
Maneer's machinist.....dis 50&10

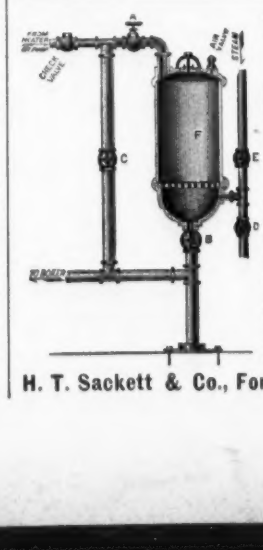
Wire.

New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " ".....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 30

Wrenches.

Coe's genuine, cash in ten days.....dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40



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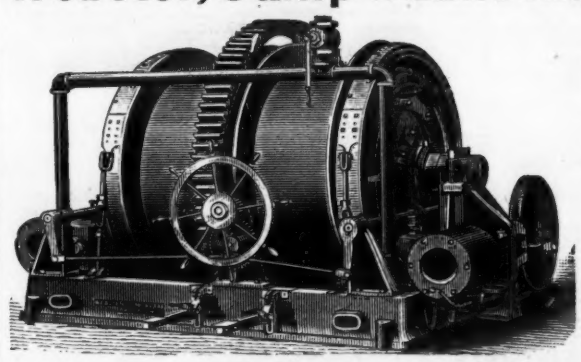

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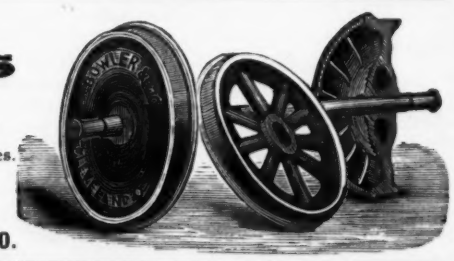

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Hollow Augers, Stearns' Adjust. ₩ doz., $48.....dis 20&10
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Standard Bit Stock Drills.....dis 50&10&5
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Cast iron shutter bolts, etc.....dis 70@70&10
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70@70&10
Wrought iron square bolts.....dis 70@70&10
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 75&7½
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 62½
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 80
Cast brass, loose joint.....dis 33⅓&10
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60&5
Fast joint, broad.....dis 55&10&5@60&10
Loose joint.....dis 70&10@75
Loose joint, jap.....dis 70&10@75
Loose joint, jap. with acorns.....dis 70&10@75
Loose pin, acorns.....dis 70&10@75
Loose pin, japanned acorns.....dis 70&10@75
Loose pin, acorns, jap. plated tips..dis 70&10@75
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10@75
Wrought, fast joint, broad.....dis 70&10@75
Wrought, loose joint, broad.....dis 70&10@75
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Trace, 7-10-2.....₩ pair 1.11
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German Coil, list of June, 1887..dis 50&10&5@60
Galvanized Pump Chain.....₩ 5½@6
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Jack Chain, Brass.....dis 70@70&5

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Star.....dis 40&10@40&10&5
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10, dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

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	No.	10	9	8	7	6	
Ausable,	₩ M.	23	24	25	26	28	dis 25&10@25&10&10
Putnam,	₩ M.	18	19	20	21	23	dis 15
Essex							dis 25&10@25&10&10

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Door mineral.....dis 65C@68C
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Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps,genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs. genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓

Plumbs and Levels.

Standard list.....dis 70&10@70&10&10
Pocket levels.....dis 70&10@70&10&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@00
Pitcher spout, best makers dis 60&10@60&10&10
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Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

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Nickel plated }
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

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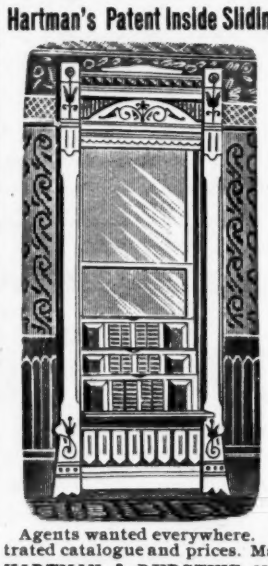
New List, January 2, 1888.
American iron carpet tacks all kinds.....dis 80@80&5
Steel carpet tacks all kinds.....dis 80@80&5
Swedes iron carpet tacks, all kinds.....dis 80@80&5
Swedes iron tacks.....dis 75&5@75&10
Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
Tinned Swedes iron tacks..dis 75&10@75&10&5
Tinned Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
American iron cut tacks.....dis 75@75&10
Copper tacks.....dis 50&10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10@50&10&5
Finishing nails.....dis 70&10@70&10&10
Hungarian nails and miners' tacks.....dis 70&10@70&10&10
Gimp and lace tacks.....dis 75&10@75&10&5
" " " tinned.dis 75&10@75&10&5
Trunk and clout nails.....dis 70&10@70&10&10
Tinned trunk&clout nails.dis 70&10@70&10&10
Basket nails.....dis 70&10@70&10&10
Chair nails.....dis 70&10@70&10&10
Common and patent brads.dis 70&10@70&10&10
Tinned capped trunk n'ls..dis 70&10@70&10&10

Hartman's Patent Inside Sliding Window Blind



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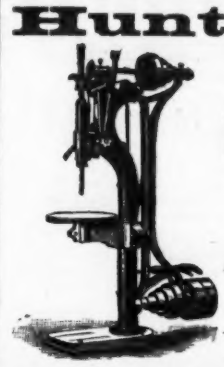

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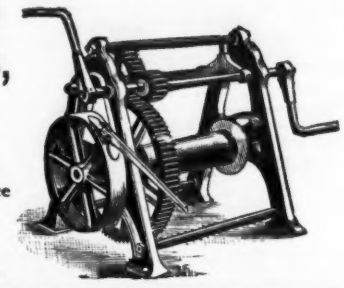

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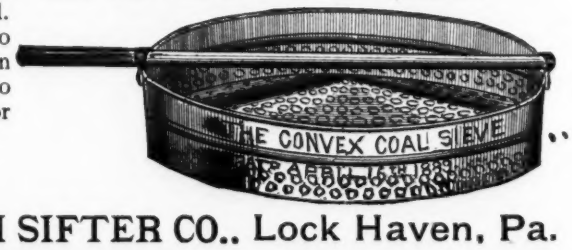

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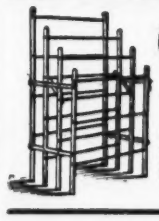

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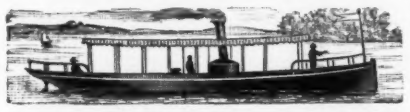

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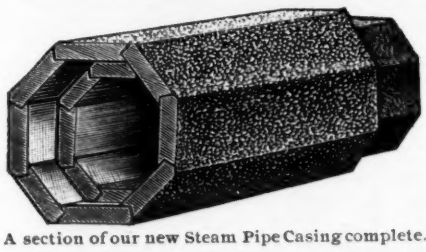

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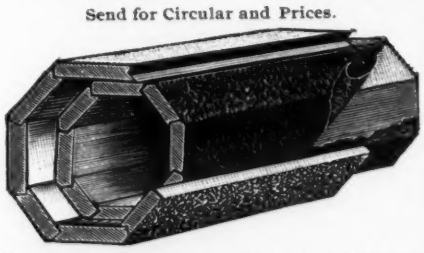

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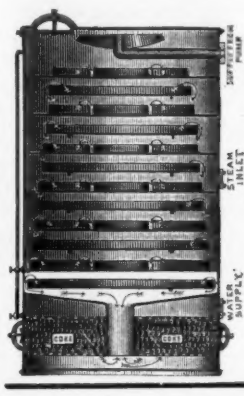

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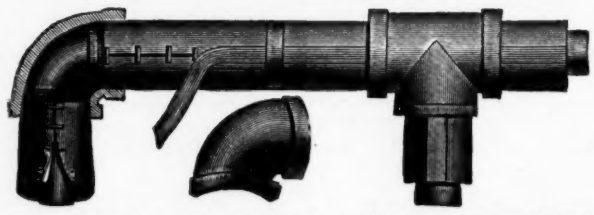

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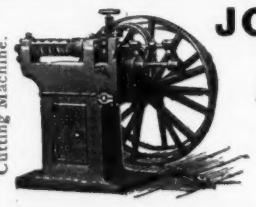

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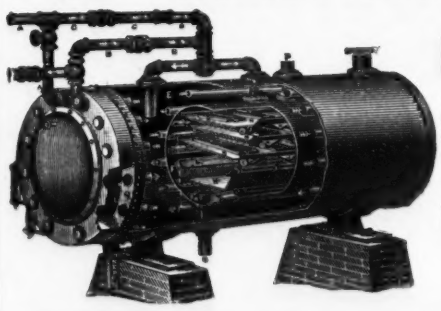

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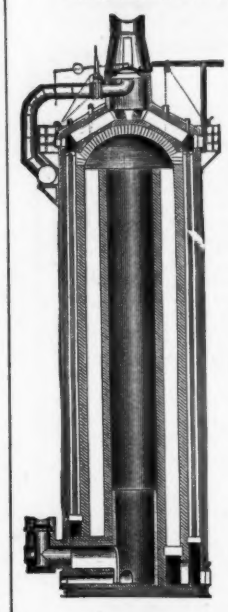

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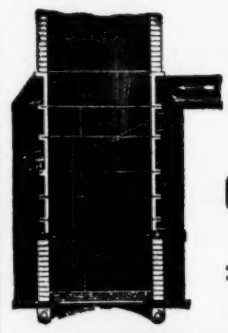

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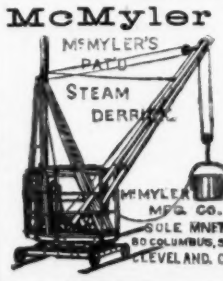

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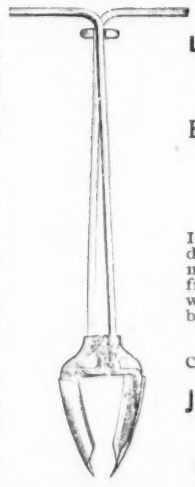

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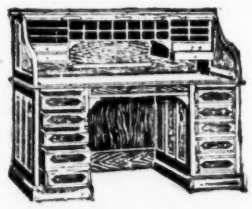

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Standard Time.

Revised March 6th, 1888.

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Local Freight	4 30 p m	.....
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Fostoria Passenger	5 06 p m	5 11 p m
Local Freight	1 00 p m	.....

Rocky River Accommodation departs 7:40 a. m.; 1:40 p. m.

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All trains daily, except Sunday.

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*Daily; all other trains daily, except Sunday.

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New York Express	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

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Zanesville and Coshocton—6:50 a. m., 3:00 p. m.
Canton—6:50 a. m., 3:00 p. m., 6:20 p. m.
Kent—6:50 a. m., 3:00 p. m., *5:45 p. m. 6:20 p. m.
Bedford—6:50 a. m., 11:10 a. m., 1:30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m. 10:35 p. m.
Newburgh—6:15 a. m., 6:50 a. m., 11:10 a. m., 1.30 p. m., 3:00 p. m., 4:40 p. m., *5:45 p. m., 6:20 p. m., 10:35 p. m.
Canton and intermediate stations (Sundays only), 8:00 a. m., 4:20 p. m.

Arrive from—

Zanesville and Coshocton—10:30 a. m., 6:30 p. m.
Canton, 10:30 a. m., 2:35 p. m., 6:30 p. m.
Kent—*8:10 a. m., 10:30 a. m., 2:35 p. m., 6:30 p.m.
Bedford—6:00 a. m., *8:10 a.m., 10:30 a.m., 1:05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p.m., 7:10 p.m.
Newburgh—6:00 a. m., 7:15 a. m., *8:10 a. m., 10:30 a. m., 1.05 p. m., 2:35 p. m., 4:15 p. m., 6:30 p. m., 7:10 p. m.
Canton and intermediate stations (Sundays only), 9:55 a. m., 6:30 p. m.

Trains marked * run daily.

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FOR AKRON, CANTON AND MARIETTA.

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail	*7 40 a m	*6 20 p m
Marietta Express	†11 15 a m	†2 20 p m
Valley Junction Express	*4 15 p m	*10 15 a m
Cleve. and Canton Express	*7 00 p m	†8 10 a m

*Daily. †Daily, except Sunday.

WM. THORNBURGH, Gen. Manager. R. A. CARRAN, Gen. Pass. Agt.

Cleveland, Lorain and Wheeling.

All trains arrive and leave the Union Depot as follows:

	Depart.	Arrive.
Wheeling Express	6 45 a m	6 55 p m
Uhrichsville Express	4 00 p m	9 20 a m

OSCAR TOWNSEND Gen. Mang'r.

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No. 72, New York Express	* 8 10 a m
No. 72, Fast Pittsburgh Express	* 8 10 a m
No. 64, Fast Pittsburgh Express	* 3 00 p m
No. 66, Mantua Accommo	* 4 20 p m
No. 68, New York Vestibule Limited	* 8 25 p m
No. 70, Pittsburgh Local Express	*11 25 a m
No. 74, Jamest'n, Pitts. & Y'ngst'n Ex	† 4 20 p m
	Arrive.
No. 65, Fast New York Express	*10 05 a m
No. 61, N. Y. & Pittsburgh Express	* 7 15 a m
No. 71, Youngstown Local	* 2 10 p m
No. 67, Pittsburgh Express	†12 30 p m
No. 63, New York Express	* 6 50 p m
No. 63, Pittsburgh Express	* 6 50 p m
No. 69, Pittsburgh Local Express	† 8 55 p m
No. 73, Mantua Accommo	* 7 20 p m

*Daily. †Daily, except Sunday.

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L. P. FARMER, Gen. Pass. Agt., New York
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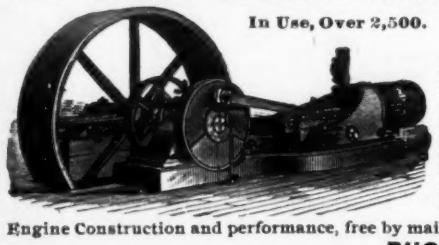

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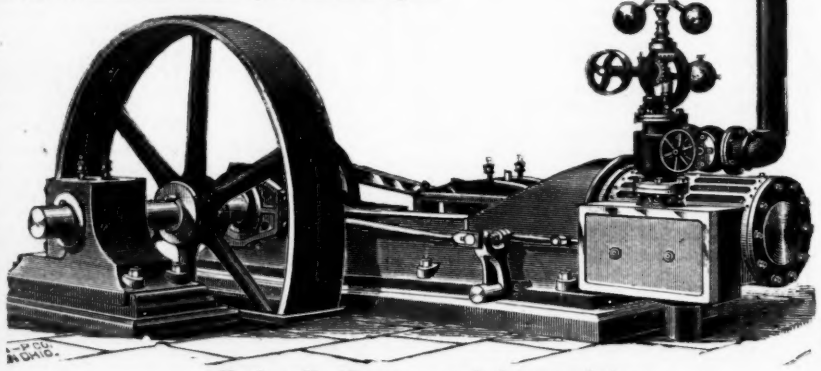

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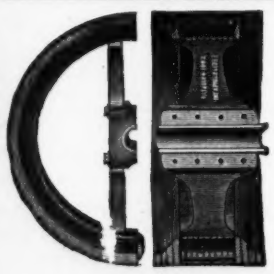

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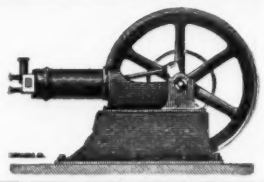

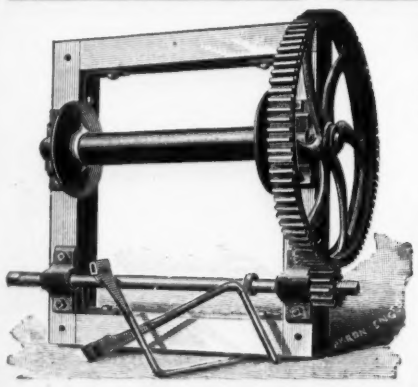

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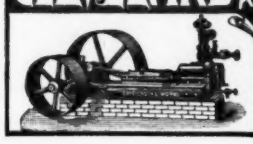

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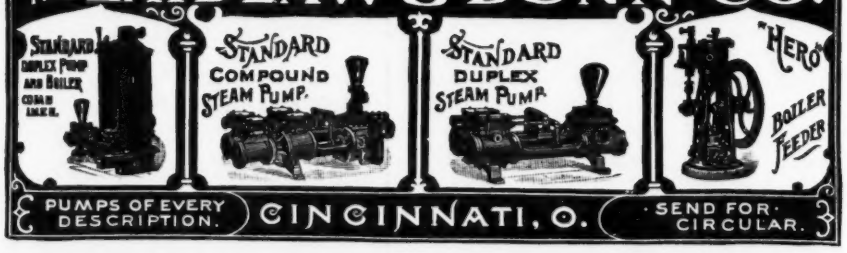

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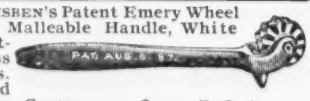

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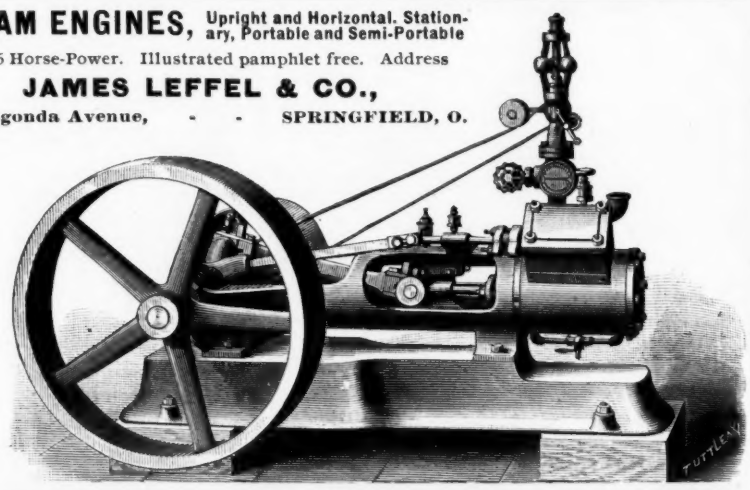

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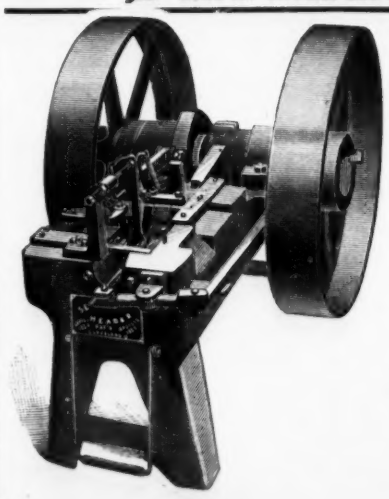

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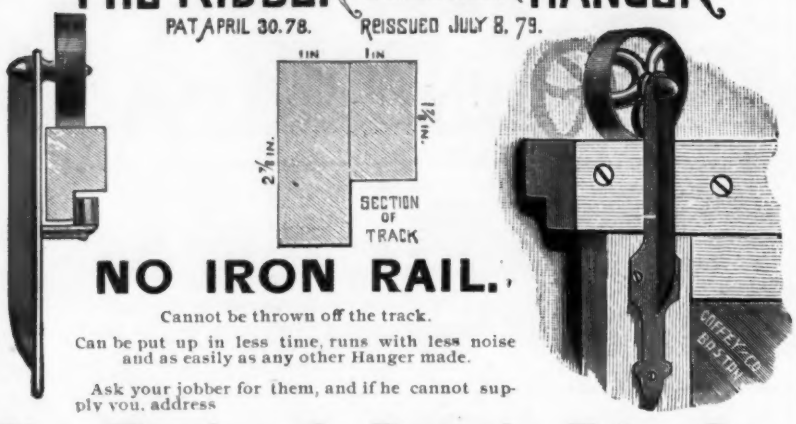

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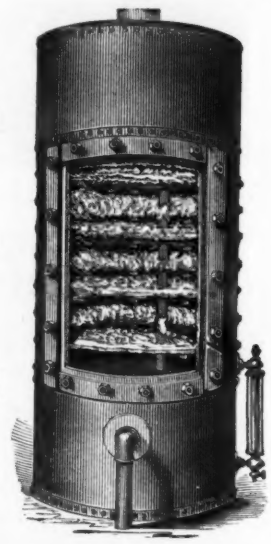

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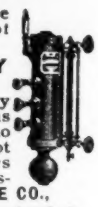

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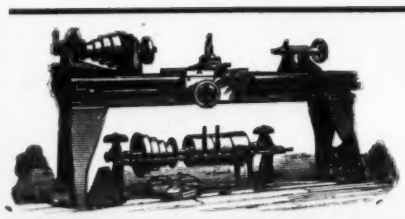

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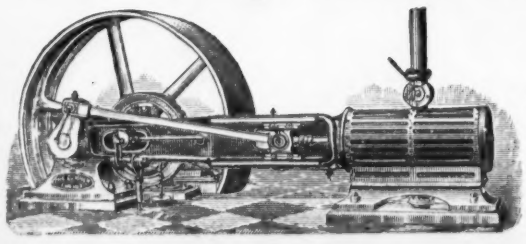

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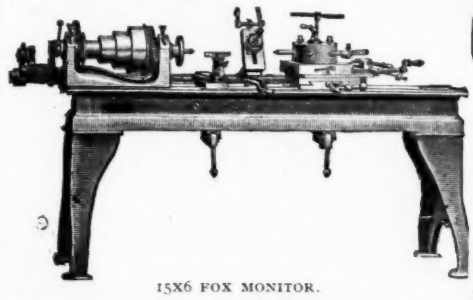

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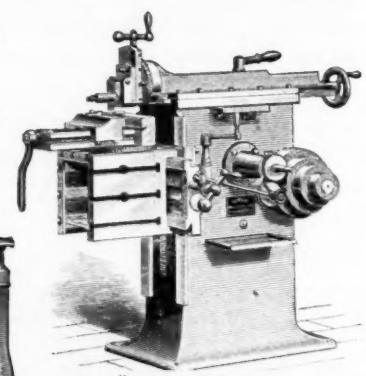

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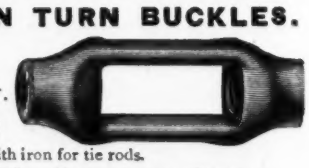

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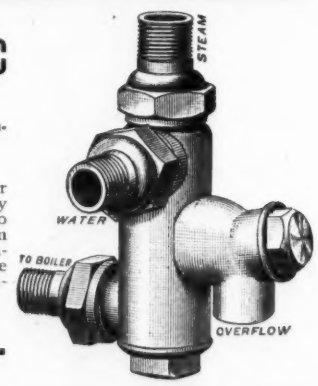

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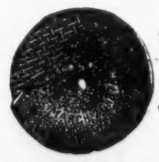

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